NASA SP-7011(281)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 281)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in January 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA

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Washington, DC

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 153 reports, articles and other documents announced during January 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 281)

FEBRUARY 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-10101
CORRELATION BETWEEN PLASMA FIBRONECTIN LEVEL AND EXPERIMENTAL RATE HEAT STRESS MORTALITY
D. A. DUBOSE, J. MCCREARY, and L. SOWDERS (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 706-709. refs

A86-10103
ROLE OF HEMOGLOBIN P50 IN O2 TRANSPORT DURING NORMOXIC AND HYPOXIC EXERCISE IN THE DOG
P. T. SCHUMACKER, A. J. SUGGETT, P. D. WAGNER, AND J. B. WEST (California, University, La Jolla) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 749-757. refs
(Contract NIH-HL-17731)

A86-10104* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EXERCISE HYPERTHERMIA AS A FACTOR LIMITING PHYSICAL PERFORMANCE - TEMPERATURE EFFECT ON MUSCLE METABOLISM
S. KOZLOWSKI, Z. BRZEZINSKA, B. KRUK, H. KACIUBA-USCILKO, J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA; Polish Academy of Sciences Medical Research Center, Warsaw, Poland) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 766-773. Research supported by the Polska Akademia Nauk. refs

The effect of trunk cooling on the muscle contents of ATP, ADP, AMP, creatine phosphate (CrP), and creatine, as well as of glycogen, some glycolytic intermediates, pyruvate, and lactate were assessed in 11 fasted dogs exercised at 20 C on treadmill to exhaustion. Without cooling, dogs were able to run 57 min, and their rectal (Tre) and muscle (Tm) temperatures increased to 41.8 and 43.0 C, respectively. Cooling with ice packs prolonged the ability to run by 45 percent, and resulted in lower Tre (by 1.1 C) and Tm (by 1.2 C). Depletion of muscle content of total high-energy phosphates (ATP + CrP) and glycogen, and increases in contents of AMP, pyruvate, and lactate were lower in cooled dogs than in non-cooled dogs. The muscle content of lactiate correlated positively with TM. These results indicate that hypothermia accelerates glycolysis, and shifts the equilibrium between high- and low-energy phosphates in favor of the latter. The adverse effect of hypothermia on muscle metabolism may be relevant to the limitation of endurance. I.S.

A86-10107
CARDIAC RESPONSE OF SUBMAXIMAL EXERCISE IN DOGS SUSCEPTIBLE TO SUDDEN CARDIAC DEATH
G. E. BILLMAN (Oklahoma, University, Oklahoma City), P. J. SCHWARTZ (Ohio State University, Columbus), J P. GAGNOL (Milano, Universita, Milan, Italy), and H. L. STONE Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 890-897. refs
(Contract NIH-HL-33718; NIH-HL-32230)

N86-10109* Marquette Univ., Milwaukee, Wis.
RECOVERY IN SKELETAL MUSCLE CONTRACTILE FUNCTION AFTER PROLONGED HINDLIMB IMMOBILIZATION
R. H. FITTS and C. J. BRIMMER (Marquette University, Milwaukee, WI) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 916-923. refs
(Contract NAG2-212)

The effect of three-month hindlimb immobilization (IM) in rats on contractile properties of slow-twitch soleus (SOL), fast-twitch extensor digitorum longus, and fast-twitch superficial region of the vastus lateralis were measured after 0, 14, 28, 60, and 90 days of recovery on excized, horizontally suspended muscles stimulated electrically to maximal twitch tonsion. IM caused decreases in muscle-to-body weight ratios for all muscles, with no complete recovery even after 90 days. The contractile properties of the fast-twitch muscles were less affected by IM than those of the slow-twitch SOL. The SOL isometric twitch duration was shortened, due to reduced contraction and half-relaxation time, both of which returned to control levels after 14 days of recovery. The peak tetanic tension, P(O), g/sq cm., decreased with IM by 46 percent in the SOL, but recovered by the 28th day. The maximum shortening velocity was not altered by IM in any of the muscles. Thus, normal contractile function could recover after prolonged limb IM. I.S.

A86-10252
COMPARATIVE BIODYNAMIC RESPONSE OF TWO PRIMATE SPECIES TO THE SAME VIBRATIONAL ENVIRONMENT
A. R. SLONIM (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 945-955.
(Contract F33615-79-C-0509)

The impedance and transmissibility characteristics of primates undergoing vertical sinusoidal vibrations were studied and attempts were made to derive interspecies scaling laws to use the primate data to predict vibrational effects on humans. Accelerometers were placed on the spines and seats of the monkeys and baboons, who were sedated when exposed to varying frequencies of g-forces of 0.177-0.283. Impedance magnitude and phase and transmissibility between the seat and two spinal accelerometers were calculated. Both animal types were found to have vibrated out of phase with the seat. The results from the Rhesus monkeys were more convergent to scale values which could be used for humans (and chimpanzees) than were the baboon data. M.S.K.

A86-10254
ELECTROCARDIOGRAPHIC CHANGES IN SERIOUS DECOMPRESSION SICKNESS
D. R. LEITCH and J. M. HALLENBECK (Institute of Naval Medicine, Alverstoke Gosport, England; U.S. Navy, Naval Medical Research Institute; Uniformed Services University of the Health Sciences, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 966-971. refs
(Contract NAVY TASK M0099,PN001,1151)

Electrocardiographic changes observed in 21 dogs suffering from spinal cord decompression sickness (DCS) are described. Changes seen included P wave peaking and P-R depression compatible with right heart strain; S-T segment and T wave changes suggestive of myocardial ischemia; and ventricular arrhythmias ranging from unifocal premature ventricular contractions to ventricular tachycardia. Compression therapy did not always restore the ECG changes promptly to normality. The changes are discussed in association with concurrent physiological events. These included pulmonary hypertension, systemic hypertension and hypotension, and cerebral DCS. Possible mechanisms ranging from local cardiac DCS or coronary gas embolism to autonomic nervous system disturbances arising from cerebral and spinal cord DCS are reviewed. It is concluded that ECG recordings should be made more often when treating clinical DCS. Author

A86-10255
EFFECTS OF 100 PERCENT OXYGEN ON THE CARDIOVASCULAR RESPONSES TO VASOACTIVE COMPOUNDS IN THE DOG
J. C. SVENTEK and E. J. ZAMBRASKI (Rutgers University, New Brunswick, NJ) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 972-975. refs
(Contract NIH-HL-25255)

A86-10256
BIOLOGICAL PARAMETERS IN JAPANESE QUAIL GENETICALLY SELECTED FOR RESISTANCE OR SENSITIVITY TO AN ACUTE HYPOXIC SURVIVAL
H. BARTELS (Hannover, Medizinische Hochschule, Hanover, West Germany), V. GOURLET, M. STUPFEL (Institut National de la Sante et de la Recherche Medical, Le Vesinet, France), A. PERRAMON (Institut National de la Recherche Agronomique, Jouy en Josas, France), and M. PIERRE (CNRS, Gif-sur-Yvette, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 976-984. refs

A86-11802
LIFE AT HIGH TEMPERATURES
T. D. BROCK (Wisconsin, University, Madison) Science (ISSN 0036-8075), vol. 230, Oct. 11, 1985, p. 132-138. NSF-supported research. refs

The types, molecular structure and metabolic activity of bacteria which can live at elevated temperatures, even beyond the boiling point of water, are discussed. The upper temperature limit for life is known to reside between 110-250 C. Prokaryotes can grow above 70 C, eukaryotes up to 60 C, and autotropic organisms above 73 C. The latter exploit inorganic energy sources such as sulfide, elemental sulfur and ferrous iron. Only members of the Archaebacteria live in regimes over 90 C. Proteins with enhanced thermal stability have exhibited extra salt bridges between portions of the folded molecules; however, the protein forming mechanism is thought to be responsible for thermostability. Several possible biotechnological applications of the high-temperature bacteria for industrial purposes are explored. M.S.K.

A86-12001* National Biomedical Research Foundation, Washington, D. C.
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)

Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins. G.R.

A86-12002* State Univ. of New York, Stony Brook.
PHYLOGENETIC ORIGINS OF THE PLANT MITOCHONDRION BASED ON A COMPARATIVE ANALYSIS OF 5S RIBOSOMAL RNA SEQUENCES
E. VILLANUEVA, N. DELIHAS (New York, State University, Stony Brook), K. R. LUEHRSEN, G. E. FOX (Houston, University, TX), and J. GIBSON (Cornell University, Ithaca, NY) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 46-52. refs
(Contract NSF PCM-83-02-127; NSG-7440)

The complete nucleotide sequences of 5S ribosomal RNAs from Rhodocyclus gelatinosa, Rhodobacter sphaeroides, and Pseudomonas cepacia were determined. Comparisons of these 5S RNA sequences show that rather than being phylogenetically related to one another, the two photosynthetic bacterial 5S RNAs share more sequence and signature homology with the RNAs of two nonphotosynthetic strains. Rhodobacter sphaeroides is specifically related to Paracoccus denitrificans and Rc. gelatinosa is related to Ps. cepacia. These results support earlier 16S ribosomal RNA studies and add two important groups to the 5S RNA data base. Unique 5S RNA structural features previously found in P. denitrificans are present also in the 5S RNA of Rb. sphaeroides; these provide the basis for subdivisional signatures. The immediate consequence of obtaining these new sequences is that it is possible to clarify the phylogenetic origins of the plant mitochondrion. In particular, a close phylogenetic relationship is found between the plant mitochondria and members of the alpha subdivision of the purple photosynthetic bacteria, namely, Rb. sphaeroides, P. denitrificans, and Rhodospirillum rubrum. Author

A86-12026* Maryland Univ., Baltimore.
TESTOSTERONE AND MUSCLE HYPERTROPHY IN FEMALE RATS
F. E. KUHN and S. R. MAX (Maryland, University, Baltimore) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, July 1985, p. 24-27. Research supported by the University of Maryland. refs
(Contract NAG2-100)

The effects of chronic treatment with testosterone propionate (TP) on compensatory muscle hypertropy in female rats are examined. The 48 female rats were placed in one of four test groups: (1) no overload (synergist removal), no TP, (2) overload, no TP, (3) no overload + TP, and (4) overload + TP. The technique used to administer the TP is described. The preparation of the plantaris muscle, the analysis of pyruvate oxidation and the determination of malate and lactate dehydrogenases and the noncollogen protein are explained. The results which reveal the effect of overload and TP on body weight, noncollogen protein concentration, lactate and malate dehydrogenase activities, and pyruvate oxidation are presented and discussed. It is concluded that in terms of body weight, protein content, pyruvate, glycolysis,

and oxidative metabolisms chronic TP treatments do not change compensatory muscle hypertropy. I.F.

A86-12378
OPPOSING HEMODYNAMIC EFFECTS OF SUBSTANCE P ON PULMONARY VASCULATURE IN RABBITS
G. S. WORTHEN, R. S. GUMBAY, D. T. TANAKA, and M. M. GRUNSTEIN (National Jewish Hospital and Research Center; Colorado, University, Denver) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1098-1103. refs
(Contract NIH-HL-25165)

The effects of substance P (SP) on rabbit pulmonary vasculature is investigated, and some of the mechanisms involved are elucidated. The net response of the vasculature is found to be dose-dependent vasoconstriction. The vasoconstrictor response appears to be mediated in part by the generation of vasoconstrictor prostaglandins and thromboxanes. A cholinergically mediated vasodilator which is activated by SP may well represent a neuromodulatory role of SP in acetylcholine release. C.D.

A86-12380*
BIOCHEMICAL RESPONSE TO CHRONIC SHORTENING IN UNLOADED SOLEUS MUSCLES
S. R. JASPERS, J. M. FAGAN, and M. E. TISCHLER (Arizona Health Sciences Center, Tucson) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1159-1163. refs
(Contract NAGW-227; NIH-AM-28647)

One leg of tail-casted suspended rats was immobilized in a plantar-flexed position to test whether chronic shortening of posterior leg muscles affected the metabolic response to unloading. The immobilized plantaris and gastrocnemius muscles of these animals showed approximately 20 percent loss of muscle mass in contrast to simply a slower growth rate with unloading. Loss of mass of the soleus muscle during suspension was not accentuated by chronic shortening. Although protein degradation in the isolated soleus muscle of the plantar-flexed limb was slightly faster than in the contralateral free limb, this difference was offset by faster synthesis of the myofibrillar protein fraction of the chronically shortened muscle. Total adenine nucleotides were 17 percent lower (P less than 0.005) in the chronically shortened soleus muscle following incubation. Glutamate, glutamine, and alanine metabolism showed little response to chronic shortening. These results suggest that, in the soleus muscle, chronic shortening did not alter significantly the metabolic responses to unloading and reduced activity. Author

A86-12381
RESPONSES OF BULBOSPINAL AND LARYNGEAL RESPIRATORY NEURONS TO HYPERCAPNIA AND HYPOXIA
W. M. ST. JOHN and A. L. BIANCHI (Dartmouth College, Hanover, NH) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1201-1207. Research supported by the Institut National de la Sante et de la Recherche Medicale and Ministere des Relations Exterieures. refs
(Contract NIH-HL-20574)

A86-12382
CHANGES IN ANTIDROMIC LATENCIES OF MEDULLARY RESPIRATORY NEURONS IN HYPERCAPNIA AND HYPOXIA
A. L. BIANCHI and W. M. ST. JOHN (Dartmouth College, Hanover, NH) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1208-1213. Research supported by the Institut National de la Sante et de la Recherche Medicale and Ministere des Relations Exterieures. refs
(Contract NIH-HL-20574)

A86-12520
WATER EXCRETION AND NATRIURETIC FUNCTION IN THE KIDNEYS OF RATS ADAPTED TO COLD [VODOVYDELITEL'NAIA I NATRIIURETICHESKAIA FUNKTSII POCHEK U KRYS PRI ADAPTATSII K KHOLODU]
T. N. ZAMAI (Krasnoiarskii Gosudarstvennyi Meditsinskii Institut, Krasnoyarsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, July 1985, p. 809-812. In Russian. refs

A86-12521
CATECHOLAMINE CONTENT OF SINGLE BRAIN NUCLEI IN AUGUST RATS FOLLOWING IMMOBILIZATION STRESS [KATEKHOLAMINY V IADRAKH MOZGA KRYS LINII AVGUST PRI IMMOBILIZATSIONNOM STRESSE]
T. M. IVANOVA, T. I. BELOVA (AMN SSSR, Institut Normal'noi Fiziologii, Moscow, USSR), R. KVETNANSKY, Z. OPRSALOVA, and M. DOBRAKOVOVA (Slovenska Akademia Vied, Ustav Experimentalnej Endokrinologie, Bratislava, Czechoslovakia) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, July 1985, p. 823-828. In Russian. refs

A86-12522
CHANGES IN THE VASCULAR FUNCTIONS OF SKELETAL MUSCLES DUE TO ACUTE HYPOTHERMIA [IZMENENIIA FUNKTSII SOSUDOV SKELETNOI MYSHTSY PRI OSTROI GIPOTERMII]
R. R. SHABAEV and IU. A. KUDRIASHOV (AMN SSSR, Nauchno-Issledovatel'skii Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, July 1985, p. 882-888. In Russian. refs

N86-10733# Committee on Energy and Commerce (U. S. House).
BIOTECHNOLOGY REGULATION
Washington GPO 1985 186 p Hearing before the Subcomm. on Oversight and Invest. of the Comm. on Energy and Com., 98th Congr., 2nd Sess., 11 Dec. 1984
(GPO-43-778) Avail: Subcommittee on Oversight and Investigations

Testimony and hearings in support of biotechnology regulation. Before The Subcommittee On Oversight And Investigations Of The Committee On Energy And Commerce House Of Representatives are presented. Special consideration is given to the regulation of genetic engineering. B.W.

N86-10734*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
LIFE SCIENCES RESEARCH ON THE SPACE STATION: AN INTRODUCTION
Sep. 1985 18 p refs
(NASA-TM-86836; REPT-85408; NAS 1.15:86836) Avail: NTIS HC A02/MF A01 CSCL 06B

The Space Station will provide an orbiting, low gravity, permanently manned facility for scientific research, starting in the 1990s. The facilities for life sciences research are being designed to allow scientific investigators to perform research in Space Medicine and Space Biology, to study the consequences of long-term exposure to space conditions, and to allow for the permanent presence of humans in space. This research, using humans, animals, and plants, will provide an understanding of the effects of the space environment on the basic processes of life. In addition, facilities are being planned for remote observations to study biologically important elements and compounds in space and on other planets (exobiology), and Earth observations to study global ecology. The life sciences community is encouraged to plan for participation in scientific research that will be made possible by the Space Station research facility. Author

N86-10735# Federation of American Societies for Experimental Biology, Bethesda, Md.
LSRO/ONR AD HOC REVIEW PROCESS Annual Progress Report, 1 May 1984 - 30 Apr. 1985
13 Jun. 1985 14 p
(Contract N00014-83-C-0196)
(AD-A156590) Avail: NTIS HC A02/MF A01 CSCL 06A

This annual progress report covers the ad hoc review process. Efforts are continuing to increase the number of peer reviewers who are experienced in the LSRO/ONR review process. The LSRO/FASEB Proposal Rating Form, the form used for the ad hoc peer review evaluation activity, has been reorganized so that it can, if required, be used by all programs of the Biological Sciences Division. The LSRO Oversight Panel on the Office of Naval Research Molecular Biology Program has continued to function with further refinement. In performing evaluations of certain aspects of the Molecular Biology Program, selected members of the LSRO Oversight Panel attended a meeting with selected contractors of the Molecular Biology Program whose research focuses on biotechnology and protein engineering. Non-contract Activities; Contract Problems Encountered and Resolved; Review Process Time; Contract Modifications; LSRO Oversight Panel Reorganization are discussed. GRA

N86-10736# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
KINETICS OF BIOLOGICAL FERROUS IRON OXIDATION
P. I. WICHLACZ and H. OLEM 1985 15 p refs Presented at the 114th AIME Ann. Meeting, New York, 24 Feb. 1985; sponsored in cooperation with Society of Mining Engineers Prepared in cooperation with Tennessee Valley Authority, Chattanooga
(Contract DE-AC07-76ID-01570)
(DE85-014616; EGG-M-27484; CONF-850211-12) Avail: NTIS HC A02/MF A01

A mathematical model of growth and ferrous iron oxidation for attached bacteria was applied to rotating biological contactor (RBC) units treating acidic mine drainage. The model describes attached bacterial growth as a saturation function, where the rate of substrate utilization is determined by a maximum substrate oxidation rate constant, a half saturation constant, and the concentration of substrate within the RBC. The maximum oxidation rate constant was proportional to flow rate and the substrate concentration in the reactor varied with influent substrate concentration. The model was tested at three separate sites and with three different size RBC units. The ability of the model to predict the rate of iron oxidation under all test conditions was significant. The accuracy of the model was found to be affected by unit size and vary with specific test site. DOE

N86-10737# Lawrence Livermore National Lab., Calif.
SOMATIC CELL AND MOLECULAR GENETICS APPROACH TO DNA REPAIR AND MUTAGENESIS
L. H. THOMPSON 14 Jun. 1985 10 p Presented at the 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(Contract W-7405-ENG-48)
(DE85-014181; UCRL-92834; CONF-8506137-4) Avail: NTIS HC A02/MF A01

In the CHO cell line, UV-sensitive mutants representing five genetic complementation groups were identified. Mutants from each of these groups were shown to be defective in performing the incision step of repair after exposure to UV. It is questioned whether the large number of complementation groups of xeroderma pigmentosa mutations of these groups all correspond to single gene loci. The same issue applies to the five groups of UV-sensitive CHO mutants. The human karyotype of the genes that complement the defects in the CHO mutants were localized. By marking CHO/human cell hybrids under the appropriate selective conditions, each of the complementing human genes are mapped. The mutation in strain UV20 (Group 2) was complemented by human chromosome 19. Preliminary evidence suggests that UV5 may also be complemented by human chromosome 19 while each of the other 3 groups involves a different human chromosome. Mutant EM9 is also complemented by a gene on chromosome 19. DOE

N86-10738# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
18 Sep. 1985 103 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-023) Avail: NTIS HC A06

Progress in research in the life sciences, with emphasis on biomedical and behavioral sciences is reported. Topics discussed include: aerospace medicine, biotechnology; military medicine, nonionizing electromagnetic radiation effects, and physiology.

N86-10741# Joint Publications Research Service, Arlington, Va.
ROMANIAN PLANT PRODUCES PROTEIN CONCENTRATE FROM PARAFFIN-NOURISHED YEASTS
In its USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 17-18 18 Sep. 1985 Transl. into ENGLISH from Nauka i Tekhn. (Riga), no. 6, May 1985 p 28-29
Avail: NTIS HC A06

Protein concentrate production from paraffin nourished yeasts is reported. Abioprotein plant converts candida type yeasts microorganisms into flour which contains protein concentrate used on cattle and animal feed. The culture growth medium contains sulfates and phosphates. Paraffin supplies the carbon essential to the microorganisms' viability. The development of a technology to produce proteins from methanol is considered. E.A.K.

N86-10742# Joint Publications Research Service, Arlington, Va.
BIOTECHNOLOGY: SCIENCE AND PRACTICE
A. ILYALETDINOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 19-21 18 Sep. 1985 Transl. into ENGLISH from Kazakhstansk. Pravda (Alma-Ata), Jun. 1985 p 3
Avail: NTIS HC A06

The development of scientific research and the introduction of biotechnology's achievements into production are discussed. The development of an antibiotics industry, based upon the use of pure microorganism cultures under sterile conditions, and a microbiological industry, producing feed protein for animal husbandry and microbiological means for fighting agricultural pests is outlined. Industrial microbiology is related. A technology for culturing feed yeasts directly in feed shops by using media containing starch preliminary subjected to fermentation with the malt of germinated grain--barley or other cereal grains is proposed. The method of fermenting starch-containing stock with malt amylase, is turned into feed production. Special species of yeast, produced by our staff members, are used to obtain the feed protein. The contributions of microbiology and virology to the development of biological Science and Scientific and technical progress are outlined. E.A.K.

N86-10754# Joint Publications Research Service, Arlington, Va.
SHORT TERM HEAT EFFECT ON ADRENO- AND CHOLINO-SENSITIVITY OF RAT'S SMALL INTESTINE Abstract Only
K. A. MEZIDOVA, B. N. MANUKHIN, and F. F. SULTANOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 70 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 2, Feb. 1985 p 195-199
Avail: NTIS HC A06

The dynamics of adreno and choline sensitivity of the smooth muscles of rat's small intestine were studied at various times after exposure to 45 C for 30 or 60 minutes. The body temperature of test animals increased rapidly under the influence of the external temperature. Sensitivity of the intestine to noradrenaline also increased under conditions of hyperthermia, following the pattern of body temperature. Sensitivity of acetylcholine was less initial heating resulted in a slight decrease followed by an increase after a 1 hr exposure; after termination of the experiment, the sensitivity remained below that of control values for about 5 days. It is

shown that changes in adrenoreceptor sensitivity could be controlled by the altering of environmental temperature. E.A.K.

N86-10760# Joint Publications Research Service, Arlington, Va.
REACTION OF RABBIT RESPIRATION SYSTEM TO HYPOXIC STIMULUS IN NITROGEN-OXYGEN MEDIUM AT ELEVATED PRESSURE Abstract Only
Z. A. DONINA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 75 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 316-319 Original language document announced in IAA as A85-33968
Avail: NTIS HC A06

Respiratory changes in exposed animals to increasing hypoxia was investigated on rabbits under normal conditions and in nitrogen-oxygen mixture at elevated pressure. While remaining at atmospheric pressure in air, the oxygen pressure in arterial blood dropped gradually during recycled breathing from a bag, resulting in hyperventilation. The largest increase in respiratory volume is observed when oxygen pressure in blood drops to 44.9 mm Hg; this occurred while the respiration becomes deeper and more frequent. During hyperbaria, the requency of breathing decreases while the depth of the respiration increases. The increase in respiratory volume and lung ventilation is accompanied by increased pressure in the lungs and by more labored breathing.
E.A.K.

N86-10761# Joint Publications Research Service, Arlington, Va.
INDICES OF BLOOD OXYGEN TRANSPORTING PROPERTIES AND ERYTHROPOIESIS IN RATS AFTER PROLONGED STAY IN NITROGEN-OXYGEN MIXTURE AT ELEVATED PRESSURE Abstract Only
A. M. VOLZHSKAYA, G. V. TROSHIKHIN, and T. Y. SHUMILOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 76 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 320-323
Avail: NTIS HC A06

Principal blood indices determining the oxygen transport properties and the intensity of erythropoiesis in rats exposed for different times to elevated pressure in a mixed nitrogen-oxygen atmosphere were investigated. After decompression, the animals showed increased concentration of hemoglobin, elevated levels of hematocrit and higher quantities of erythrocytes, which persisted for 4 hrs; after 24 hrs the values returned to normal. The concentration of 2,3-diphosphoglycerate in erythrocytes increased and remained that way for 72 hrs. The erythropoietic activity was intensified through the 72 hrs. Mechanisms aimed at improving delivery of oxygen to the tissue and representing compensatory reactions to hypoxia are indicated. E.A.K.

N86-10762# Joint Publications Research Service, Arlington, Va.
HOMOCARNOSIN IN RAT BRAIN DURING ADAPTATION TO COLD Abstract Only
T. I. BONDARENKO, A. A. KRICHEVSKAYA, and G. N. KOSHCHIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 76 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 333-336
Avail: NTIS HC A06

Homocarnosin (gamma-aminobutyryl-1-histidine) is a peptide neuromediator of the central nervous system; its content in white rate brain was studied during cold adaptation process lasting from 1 to 45 days. It was shown that the homocarnosin level dropped progressively with exposure to this temperature. During the stress period, peroxide oxidation intensified and the hemoglobin in serum was elevated. Stimulation of the peroxide oxidation damaged some enzymes and the structure of the membranes and some of their properties were altered. Adaptation time to the cold varied in different animals. At that time the level of homocarnosin in cold-adapted animals was 56% lower than controls. The exposure to low temperature led to decrease in homocarnosin-carnosynthetase activity which explained the lower levels of homocarnosin in cold adapted animals. E.A.K.

N86-10763# Joint Publications Research Service, Arlington, Va.
EFFICIENCY OF MUSCULAR WORK IN WHITE RATS DURING ADAPTATION TO COLD Abstract Only
Y. Y. TKACHENKO and M. A. YAKIMENKO *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 77 18 Sep, 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 337-341
Avail: NTIS HC A06

The relationship between heat production and muscle work performed under various work loads by adult rats adapted to a cold medium was investigated to determine the maximum of work ability and its energetic optimum. Temperature increase in the contracting muscle per unit work (delta/A) was plotted as a function of the magnitude of completed work by cold-adapted and control rats. It is shown that work effectiveness changed with adaptation in cold: optimum performance was achieved by cold adapted animals with loads of 200 to 250 g as compared to controls which showed a 320 to 380 g loads. E.A.K.

N86-10764# Joint Publications Research Service, Arlington, Va.
INTRADIURNIAL ORGANIZATION OF WAKEFULNESS-SLEEP SEQUENCE AND ENERGY METABOLISM IN RATS EXPOSED TO LOW AMBIENT TEMPERATURE Abstract Only
V. S. SAZONOV and Y. F. PASTUKHOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 77 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 342-347 Original language document announced in IAA as A85-36611
Avail: NTIS HC A06

Sleep characteristics were studied as a function of energy exchange under conditions of acute and chronic exposure to low ambient temperature. Two sleep phases were identified in all animals regardless of the temperature; (1) slow wave sleep, further subdivided into surface and deep subgroups; and (2) paradoxial sleep. Three control rats were used and five cold-adapted ones. At low ambient temperature, controls had a lighter, shorter and often interrupted sleep. After cold adaptation daily sleeping period increased both at low and ambient temperatures. It is assumed that after prolonged cold the sleep initiation mechanisms continue to be active, while those of the sleep development arrested.
E.A.K.

N86-10766# Joint Publications Research Service, Arlington, Va.
EFFECT OF COLD ON BRAIN SEROTONIN SYSTEM AND PLASMA CORTICOSTEROID LEVEL IN DIFFERENT STRAINS OF MICE Abstract Only
L. A. KORYAKINA, A. V. KULIKOV, M. Y. FIGUROVA, and N. K. POPOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 78-79 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 422-427
Avail: NTIS HC A06

The activity of tryptophan hydroxylase in brain and was evaluated the plasma corticosteroid levels in male mice while exposed to +4 C for 1 or 6 hrs. It is shown that the activity of tryptophan hydroxylase dropped during the cooling process, and it is assumed that the activity of the entire serotonin system in brain lowered. Decreased synthesis of serotonin supported temperature homeostasis and increased the resistance of animals to cold. The changes in the serotonin system were of an adaptive nature. No linear relationship is noted between the degree of activation of hypothalamo-hypophyseal-adrenal systems and the drop in body temperature of the experimental animals. It is assumed that the observed changes in the synthesis of biogenic amine represent a specific reaction of the body to the cooling process and are caused by participation of brain serotonin in central thermoregulation. E.A.K.

N86-10767# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF GENERAL RESISTANCE OF RATS DURING READAPTATION PERIOD AFTER TRAINING IN ALTERED GAS ENVIRONMENT Abstract Only
Y. Y. ZVERKOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 79 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 4, Apr. 1985 p 523-526
Avail: NTIS HC A06

The duration of retained resistance of animals to external conditions was studied on 330 white rats as a function of adaptive training and specific conditions of altered gas medium. The adaptation training to combined hypoxia and hypercapnia or to pure hypoxia lasted 15 and 30 days for each modality. It was shown that a 15-day training by either of above methods had an insignificant effect on high altutide resistance. The animals exposed to 30 day treatment showed significant increase in resistance to acute hypoxia. The high altitude resistance was higher at all times in the groups exposed to a combination of hypoxia and hypercapnia training. This type of resistance lasted for up to 60 days after thre readaptation period. E.A.K.

N86-11829*# Wisconsin Univ., Madison. Dept. of Horticulture.
CONTROLLED ENVIRONMENT LIFE SUPPORT SYSTEM: CALCIUM-RELATED LEAF INJURIES ON PLANTS Final Report, May 1981 - Apr. 1984
T. W. TIBBITTS 1985 44 p refs
(Contract NCC2-136)
(NASA-CR-176288; NAS 1.26:176288) Avail: NTIS HC A03/MF A01 CSCL 06C

A calcium related injury in lettuce termed tipburn was the focus of this study. It affects the young developing leaves as they become enclosed during head formation. It is a good model system to study because the injury can be induced with good predictability and lettuce is one of the crops chosen by the CELSS program for concentrated study. Investigations were undertaken to study a number of different procedures, that would have the potential for encouraging movement of calcium into the young developing leaves and to study the time course and pattern of calcium accumulation in developing leaves to provide a basis for developing effective control procedures for this injury. Author

N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
(Contract NCC2-231)
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System. Author

N86-11831*# San Francisco Univ., Calif.
STRUCTURE AND FUNCTION OF ISOZYMES: EVOLUTIONARY ASPECTS AND ROLE OF OXYGEN IN EUCARYOTIC ORGANISMS Final Report
T. SATYANARAYANA Sep. 1985 11 p refs
(Contract NCC2-85)
(NASA-CR-176286; NAS 1.26:176286) Avail: NTIS HC A02/MF A01 CSCL 06C

Oxygen is not only one of the most abundant elements on the Earth, but it is also one of the most important elements for life. In terms of composition, the feature of the atmosphere that most distinguishes Earth from other planets is the presence of abundant amounts of oxygen. The first forms of life may have been similar to present day anaerobic bacteria such as clostridium. The relationship between prokaryotes and eukaryotes, if any, has been a topic of much speculation. With only a few exceptions eukaryotes are oxygen-utilizing organisms. This research eukaryotes or eukaryotic biochemical processes requiring oxygen, could have arisen quite early in evolution and utilized the small quantities of photocatalytically produced oxygen which are thought to have been present on the Earth prior to the evolution of massive amounts of photosynthetically-produced oxygen. B.W.

N86-11832# Army Research Inst. of Environmental Medicine, Natick, Mass.
AN ATROPINIZED HEAT-STRESSED RAT MODEL: ANTICHOLINERGIC AND ANTICHOLINESTERASE DRUG POTENCY
C. B. MATTHEW, R. W. HUBBARD, and R. P. FRANCESCONI Jul. 1985 18 p
(Contract DA PROJ. 3M1-62734-A-875)
(AD-A157620; USARIEM-M-34/85) Avail: NTIS HC A02/MF A01 CSCL 06O

We have developed an animal model to evaluate the thermoregulatory effects of several anticholinergic drugs, particularly in hot environments. Our previous work on this model demonstrated that atropine, the prototype of muscarinic anticholinergic drugs, produces a dose-dependent increase in heating rate of heat-stressed rats that lasted for 3 hours after administration. By comparing the effects on heating rate of other anticholinergic drugs relative to the effects of atropine, we derived the following potency ratios: imipramine (0.004), amitriptyline (0.02), chlorpromazine (0.1), atropine (1); L-hyoscymaine (2), atropine methyl nitrate (4), and scopolamine (16). Additionally, we tested the ability of carbamates to reduce the elevated heating rate of atropinized rats as a measure of anticholinesterase efficacy, resulting in the following relative potencies: neostigmine (8), physostigmine (2) and pyridostigmine (1). Our results indicate that this is a useful model to evaluate potential drug-exacerbated increases in body temperature in hot environments. GRA

N86-11833# Oak Ridge National Lab., Tenn.
POSITIVE GENETIC HAZARD PREDICTIONS FROM SHORT-TERM TESTS HAVE PROVED FALSE FOR RESULTS IN MAMMALIAN SPERMATOGONIA WITH ALL ENVIRONMENTAL CHEMICALS SO FAR TESTED
W. L. RUSSELL 1985 9 p refs Presented at the 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013640; CONF-8506137-1) Avail: NTIS HC A02/MF A01

Eleven chemicals for which there has been considerable human exposure were studied by the mouse specific-locus method because of their positive mutagenic action in other test systems. All were positive in the Drosophila sex-linked recessive lethal test, and in mammalian somatic cells proved muagenic. In mouse stem-cell spermatogonia none of the chemicals, even at maximum tolerated dose, has given a specific-locus mutation frequency higher than the control, and the mutation frequency for all eleven combined (12 mutations in 298,502 offspring) was actually less than the historical control. Absence of mutation induction cannot be attributed to: (1) failure of the chemicals to reach the testis (10 of them are known to reach the testis in active form), (2) small sample size (the samples are large), and (3) insensitivity of

the test (the test is not insensitive, a positive control gave a mutation frequency 132 times higher than the historical control). It is concluded that mammalian stem-cell spermatogonia have an effective repair capability. DOE

N86-11834# Lawrence Livermore National Lab., Calif.
DETECTION OF CHROMOSOMAL ABNORMALITIES IN HUMAN SPERM
B. BRANDRIFF, L. GORDON, A. K. ASHWORTH, G. WATCHMAKER, and A. V. CARRANO 19 Jun. 1985 9 p refs Presented at the 4th Intern. Conf. on Environ. Mutgens, Stockholm, 24 Jun. 1985
(Contract W-7405-ENG-48)
(DE85-014178; UCRL-92835; CONF-8506137-3) Avail: NTIS HC A02/MF A01

A new technology developed by Rudak, et al., for examining the chromosomal constitution of human sperm through fusion with eggs from the Syrian hamster was used to obtain baseline data on the types and frequencies of aberrations in sperm of normal men. The frequency of structural aberrations in 2724 sperm chromosome karyotypes from the 13 healthy non-exposed donors ranged from 2 to 15.8%, demonstrating significant interindividual variability. The most frequently occurring aberrations were chromosome breaks, followed by acentric fragments, chromatid exchanges, chromatid breaks, dicentrics and translocations, chromosome deletions and duplications, inversions, and chromatid deletions. Two donors previously reported had one cell each with multiple chromatid exchanges and breaks. In addition, the oldest donor, AA, had 5 cells out of 124 examined with multiple breaks and rearrangements too extensive to completely identify. DOE

N86-11835# Oak Ridge National Lab., Tenn.
RELATIONSHIP BETWEEN ALKYLATION SITES AND INDUCTION OF DOMINANT LETHALS AND HERITABLE TRANSLOCATIONS IN MICE
W. M. GENEROSO 1985 8 p refs Presented at the 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014309; CONF-8506137-6) Avail: NTIS HC A02/MF A01

Production of dominant lethals and heritable translocations is determined by the degree of stability of alkylation products within the chromosome. If repair is not effected in the fertilized eggs and the alkylation products persist to the time of pronuclear chromosome replication or early cleavage divisions, they lead to chromatid-type aberrations and eventually to lethality. The production of heritable translocations requires a transformation of unstable alkylation products into suitable intermediate lesions. These lesions are converted into chromosome exchanges prior to the time of pronuclear chromosome replication. Dominant lethals result from both chromatid and chromosome-type aberrations while heritable translocations results primarily from the latter type. It is inherent that the production of chromosome and chromatid-type aberrations by a chemical mutagen are not necessarily mutually exclusive. E.A.K.

N86-11836# Oak Ridge National Lab., Tenn.
INFORMATION FROM SPECIFIC-LOCUS MUTANTS ON THE NATURE OF INDUCED AND SPONTANEOUS MUTATIONS IN THE MOUSE
L. B. RUSSELL 1985 12 p refs Presented at 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(DE85-014313; CONF-8506123-7) Avail: NTIS HC A02/MF A01

Genetic and molecular analyses of mutations are increasing the qualitative capabilities of the specific-locus test (SLT). Some mutations are found to be deletions of large numbers of genes, including some that control survival at various developmental stages, neurological functions, enzyme syntheses, etc. Smaller (including possibly single-gene) deletions are also detected. A third group of SLT mutations represents intragenic lesions. For at least three of the loci, mutations may now be qualitatively grouped on the basis of simple phenotypic findings. Type of mutagen and germ-cell stage exposed strongly influence the nature of the lesions. The qualitative information from SLT results makes possible conclusions about relative potential harmfulness of different types of exposures that may yield equal mutation rates, about difference between induced and spontaneous mutations, etc. It also identifies genetic material suitable for basic studies. DOE

N86-11837# Tulsa Univ., Okla.
TERATOGENIC EFFECTS OF MICROWAVE RADIATION Final Report, 1980 - 1985
M. E. OCONNOR and R. STRATTAN May 1985 51 p
(Contract EPA-68-02-3453)
(PB85-207462; EPA-600/1-85-007) Avail: NTIS HC A04/MF A01 CSCL 06T

Pregnant CF-1 mice was exposed to 2450-MHz CW microwave irradiation at power densities of 0, 10, or 30 mW/sq. cm for 6 hours daily from gestational day 1 through day 18. All exposures occurred in an anechoic chamber maintained at 50% relative humidity with air temperature of 22C. A group of pregnant colon cage-control mice was maintained for each of the three exposure groups. Teratogenic examinations were performed on day 18 following Caesarean section of the maternal subject. Every third fetus was stained with alazarin red and examined for skeletal abnormalities. No significant differences between the groups observed for fetal body mass, fetal brain mass, resorption, live fetuses, gross abnormalities, or skeletal abnormalities.
Author (GRA)

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-10105
CONTROL OF EXERCISE HYPERPNEA DURING HYPERCAPNIA IN HUMANS
C.-S. POON and J. G. GREENE (North Dakota State University; U.S. Veterans Administration Hospital, Fargo; North Dakota, University, Grand Forks) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 792-797. Research supported by the American Heart Association. refs
(Contract NIH-HL-30794; NIH-RR-02142)

CO2-exercise interaction during exercise under controlled hypercapnia was examined in terms of ventilatory responses in eight male subjects during four sequential 5 min incremental treadmill runs from rest up to a maximum CO2 output, V(CO2). Arterial isocapnia was maintained by continual adjustment of the inspired P(CO2). The response in total ventilation, V(E), to exercise V(CO2) was linear at all levels of arterial P(CO2). Hypercapnia resulted in corresponding increases in both the slope and the intercept of the V(E)-V(CO2) curve, that were directly proportional to the rise in arterial P(CO2). Thus, concomitant hypercapnia and exercise af[illegible] the ventilatory response synergistically, suggesting positive int[illegible]action between these stimuli. The increased exercise sensitivity in hypercapnia is qualitatively consistent with the hypothesis that V(E) is controlled to minimize the conflicting challenges due to chemical drive and the mechanical work of breathing (Poon, 1983). I.S.

A86-10106
ENHANCED METABOLIC RESPONSE TO CAFFEINE IN EXERCISE-TRAINED HUMAN SUBJECTS
J. LEBLANC, M. JOBIN, J. COTE, P. SAMSON, and A. LABRIE (Universite, Laval, Quebec, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 832-837. refs

The effect of caffeine on resting metabolic rate (RMR) was investigated in eight trained and eight nontrained young male subjects. The ingestion of 4 mg/kg caffeine produced a greater increase of RMR in trained subjects. This effect was associated with a greater increase in plasma free fatty acids and a larger fall

in respiratory quotient, indicating an enhanced lipid oxidation following caffeine in exercise-trained subjects. An initial fall in plasma glucose was observed but only in trained subjects, and caffeine did not change plasma insulin in either group studied. Caffeine caused a significant fall in plasma norepinephrine and an increase in plasma epinephrine in both groups of subjects, but this action was significantly greater in trained subjects. It is suggested that the greater increase in RMR observed in trained subjects following caffeine ingestion is related to an enhanced lipid mobilization possibly produced by a greater epinephrine secretion and by subsequent increased lipid oxidation. Author

A86-10108
HEADACHE AT HIGH ALTITUDE IS NOT RELATED TO INTERNAL CAROTID ARTERIAL BLOOD VELOCITY
J. T. REEVES, L. G. MOORE, R. E. MCCULLOUGH, R. G. MCCULLOUGH, G. HARRISON (Colorado, University, Denver; Colorado State University, Fort Collins) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 909-915. refs
(Contract NIH-HL-14985)

Internal carotid blood velocity (CBV) was measured by the Doppler ultrasound technique at 1600 m (Denver), and repeatedly up to 7 h at a simulated (430 Torr) altitude of 4800 m, in 6 subjects known to be susceptible to altitude-causing headaches (HA group) and in 6 other subjects without such history (C group). During the measurements of hypercapnic response in Denver, CBV was shown to increase linearly with end-tidal PCO2, confirming that the Doppler method could demonstrate an increase. All six subjects in the HA group developed severe headache at 4800 m, whereas in the control group, four subjects remained well, and two others developed moderate headache. CBV at 4800 m did not correlate with symptom development, arterial O2 saturation, or end-tidal P(CO2). In addition, neither CBV nor blood pressure were consistently elevated above the Denver baseline values. Thus, the cerebral blood flow does not appear to play a primary role in causing headache symptoms at high altitude. I.S.

A86-10110
LACTATE, PYRUVATE, AND LACTATE-TO-PYRUVATE RATIO DURING EXERCISE AND RECOVERY
K. WASSERMAN, W. L. BEAVER, J. A. DAVIS, J.-Z. PU, D. HEBER (California, University, Los Angeles and Torrance) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 935-940. refs
(Contract NIH-HL-11907)

A86-10111
PLASMA LEVELS OF RENIN, ANGIOTENSIN II, AND 6-KETOPROSTAGLANDIN F1-ALPHA IN ENDURANCE ATHLETES
R. FAGARD, R. GRAUWELS, D. GROESENEKEN, P. LIJNEN, J. STAESSEN (Leuven, Katholieke Universiteit, Louvain, Belgium) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 947-952. FNRS-supported research. refs

A86-10251
AIRLINE PILOT DISABILITY - THE CONTINUED EXPERIENCE OF A MAJOR U.S. AIRLINE
G. W. HOLT, W. F. TAYLOR, and E. T. CARTER (Mayo Clinic; Mayo Foundation, Rochester, MN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 939-944. refs

A statistical analysis is carried out of the results of pilot pre-employment screening by airline medical departments, along with a survey of the change of pilot disability rates over time. The survey covers 1832 pilots over the period 1975 to the end of 1982, including 368 pilots who underwent pre-employment screening. Of the screened pilots, 45 were unacceptable due to psychological reasons, 28 for nonpsychological characteristics. Cardiovascular diseases were the greatest cause of disability, indicating that attention be given to hyperlipidemia, smoking, glucose intolerance, hypertension and genetic background during screening. The study also revealed that the disability rates have decreased over time, although the cause(s) for the decrease(s) was not identified. M.S.K.

A86-10253
PERFORMANCE AND PHYSIOLOGICAL EFFECTS OF ACCELERATION-INDUCED (+GZ) LOSS OF CONSCIOUSNESS
J. O. HOUGHTON, D. K. MCBRIDE, and K. HANNAH (U.S. Navy, Naval Air Development Center, Warminster, PA; U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 956-965. refs

Eight humans underwent centrifugal tests in an experiment designed to quantify the levels of pilot performance skills during the three stages of loss of consciousness (LOC) recovery. The stages are unconsciousness, relative incapacitation, and normalization. Extensive physiological, sensory and audio instrumentation were used to monitor the subjects before, during and after centrifuge sessions which featured steadily increasign g-levels from 0.067-8.0 g. The subjects were required to perform spatial and verbal information processing tasks and produce vocal and motor responses. LOC occurred at 5.0-8.0 g. The results indicated that pilots will not reach normal performance levels for 2-3 min after recovery from LOC. No correlations were found between g-tolerance and LOC recoverability. M.S.K.

A86-10257* National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
CARDIOVASCULAR DECONDITIONING DURING SPACE FLIGHT AND THE USE OF SALINE AS A COUNTERMEASURE TO ORTHOSTATIC INTOLERANCE
M. W. BUNGO, J. B. CHARLES, and P. C. JOHNSON, JR. (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 985-990. refs

Results are reported of trials with oral hydration by astronauts before reentry of the Orbiter. The experiments were run to evaluate hydration as a means of offsetting the loss of lower body negative pressure experienced after several days in space. The rehydration was carried out by 17 astronauts who ingested salt tablets and water prior to the end of the first eight STS mission orbital phases; nine astronauts abstained. Pulse and blood pressure data were collected from 1-2 hr post landing. Measurements were also made of the extent of cardiac deconditioning and the response to orthostatic stress (standing). Ingestion of the salt tablets reduced the heart rate response to stress an average of 29 percent. The statistical significance of the difference has encouraged adoption of the salt tablet countermeasure as an operational procedure by Shuttle astronauts. M.S.K.

A86-10259
SERUM LEVELS OF ELEVEN STEROID HORMONES FOLLOWING MOTION SICKNESS
G. K. STALLA, H. G. DOERR, F. BIDLINGMAIER, W. G. SIPPEL, and W. VON RESTORFF (Luftwaffe, Flugmedizinisches Institut, Fuerstenfeldbruck; Muenchen, Universitaet, Munich; Kiel, Universitaet, West Germany) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 995-999. refs

Fifteen blindfolded male subjects were subjected to motion sickness-inducing trials in a study of the relationship between steroid hormonal responses and the severity of motion sickness (MS). The subjects executed upper body movements while rotating on a Baranyi chair at 72 deg/sec. Symptoms were recorded every 2 min in trials lasting up to 30 min to a point of intolerance. Blood samples were taken with a cannula inserted into the antebrachial vein. The levels of 11 hormones were monitored and the subjects were ranked in three groups according to MS tolerance. The rapid rise of hormones such as androstendione and 11-deoxycortisol in response to short exposure to MS-inducing situations showed promise as valid indicators of the severity of MS intolerance. M.S.K.

A86-10262
CALCIFIED HEMATOMA OF THE GREATER OMENTUM IN AN F-15 FIGHTER PILOT
P. D. HATTON and F. J. HARFORD, JR. (USAF, Wilford Hall Medical Center, Lackland AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 1009, 1010. refs

A high performance aircraft test pilot who presented with acalculous cholecystitis was found to have a calcified omental hematoma adjacent to the gallbladder. Omental hematomas have not previously been linked to flight in high performance aircraft. Current prevailing hypotheses regarding etiologies of omental hematomas include rapid blood flow shifts and venous fragility. Forces encountered in high performance aircraft may increase the chance of omental hemorrhage. Author

A86-10695
THERMOVISUAL INDICATORS OF BRAIN REACTIONS TO VISUAL STIMULI [TEPLOVIZIONNYE POKAZATELI REAKTSII MOZGA NA ZRITEL'NYE RAZDRAZHENIIA]
I. A. SHEVELEV, E. N. TSYKALOV, A. M. GORBACH, K. P. BUDKO, and G. A. SHARAEV (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 538-543. In Russian. refs

A noninvasive thermovisual method was used to detect thermal reaction in the occitoparietal area of human brain cortex to stimulation of the eye with light from a photostimulator. The temporal, spatial, and temperature characteristics of the thermal effect were obtained by use of the AGA-780 thermovisor connected to a computer system. Possible mechanisms of the interrelationship between the visual stimuli and the thermal reaction of the human brain are discussed. I.S.

A86-10696
NEURONAL REACTIONS AND EVOKED POTENTIALS IN THE SUBCORTICAL BRAIN STRUCTURES IN THE PROCESS OF VISUAL RECOGNITION. I FORMULATION OF THE PROBLEM AND BASIC METHODS FOR ITS SOLUTION [REAKTSII NEIRONOV I VYZVANNYE POTENTSIALY V PODKORKOVYKH STRUKTURAKH MOZGA PRI ZRITEL'NOM OPOZNANII. I - POSTANOVKA ZADACHI I OSNOVNYE METODY EE RESHENIIA]
IU. D. KROPOTOV and V. A. PONOMAREV (AMN SSSR, Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 563-575. In Russian. refs

The problems of studying the neurophysiological processes taking place during visual perception are discussed, including the methods used and the results obtained. The effects of visual stimuli on neuronal impulses and evoked potentials were registered in patients during functional diagnoses with the use of implanted electrodes. It was demonstrated that the processes of visual perception induce neuronal activity in the nuclei of the thalamus and striopallidal system. The nature of these reactions depends on the type of activity initiated by the visual stimuli. A system of psychological tests is proposed for the analysis of characteristic responses in the human brain to somatosensory features of visual stimuli. I.S.

A86-10697
PRESTIMULUS EEG AND EVOKED POTENTIALS IN MAN DURING THE RECOGNITION OF A MEANINGFUL LIGHT STIMULUS [PREDSTIMUL'NYE EEG I VYZVANNYE POTENTSIALY CHELOVEKA PRI OPOZNANII ZNACHIMOGO SVETOVOGO STIMULA]
L. A. POTULOVA and IA. A. VASILEV (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 580-585. In Russian. refs

EEG spectra for the motor and vision areas of the neocortex were recorded before and during exposure to digital light stimuli in order to determine what changes in the spectral correlation parameters of the prestimulus EEG and what components of the evoked potential (EP) accompany recognition of the light stimulus. It was found that correct recognition is manifested in an increase in the amplitude and a shortening of the latent period of the late component N 140 of the EP. A decrease in the relative number of slow waves and an increase in the number of fast waves in the background potential of the neocortex were recorded. A decrease in the correlation coefficient (cc) in the left hemisphere corresponded to an increase in the cc in the right hemisphere. I.S.

A86-10698
CHARACTERISTICS OF EXTERNAL RESPIRATION IN INHABITANTS OF THE NORTHEASTERN USSR [OSOBENNOSTI VNESHNEGO DYKHANIIA U ZHITELEI SEVERO-VOSTOKA SSSR]
L. N. MATVEEV, A. G. MARACHEV, A. N. KOZIN, S. A. KHARKOV, and I. Z. SHERES (AMN SSSR, Institut Morfologii Cheloveva; Moskovskii Medizinskii Stomatologicheskii Institut, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 634-640. In Russian. refs

The respiratory volume and rate parameters measured in 246 short-term and long-term residents of the northeastern USSR were compared to the corresponding features of 90 Moscow residents to determine the effects of residence in the far north on the respiratory system. A positive decline in the average values of respiratory rate parameters was found in the inhabitants of the northeast, compared to the Moscow inhabitants, leading to a decrease in the maximal efficiency in the gas exchange and to the reduction of the breathing reserve by one third. Subjects who lived in the northeast for more than 10 years exhibited alterations in functional parameters that indicate changes in lung parenchyma, resulting in a considerable decrease in breathing reserve. I.S.

A86-10699
INDICATORS OF EXTERNAL RESPIRATION IN YOUNG ATHLETES DURING ADAPTATION TO HIGH ENVIRONMENTAL TEMPERATURE [POKAZATELI VNESHNEGO DYKHANIIA U IUNYKH SPORTSMENOV PRI ADAPTATSII K VYSOKOI TEMPERATURE SREDY]
K. N. KACHANOVSKII (Turkmenskii Gosudarstvennyi Pedagogicheskii Institut, Chardzhou, Turkmen SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 641-644. In Russian. refs

A86-10700
THE EFFECT OF 24-HR SLEEP DEPRIVATION ON THE METABOLISM OF BIOGENIC AMINES [VLIIANIE 24-CHASOVOI DEPRIVATSII SNA NA OBMEN BIOGENNYKH AMINOV]
T. D. BOLSHSKOVA, S. A. MESHCHERIAKOVA, V. F. TIABENKOVA, N. I. ROMANOVA, IA. I. LEVIN (I Moskovskii Meditsinskii Institut, Moscow, USSR) et al. Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 652-656. In Russian. refs

Concentrations of catecholamines, serotonin, histamine, and their metabolites before, during, and after 24-hr sleep deprivation (SD), and after a night of restorative sleep were measured in the blood and urine of 10 healthy men. The excretion of all amines rose above the control levels after the sleepless night, indicating increased secretory activity in the system of biogenic amines. Chemical changes accompanied the increased levels of behavioral activity reported earlier (Vein et al., 1982; Levin, 1983). Most of the changes disappeared after the restoration period, except those of the metabolic indicators of serotonin and tryptophan, which showed lingering reductions in blood activities. It is suggested that this residual lingering effect of SD might be at the base of biological changes caused by frequently repeated periods of SD, which may lead to permanent pathological conditions. I.S.

A86-10701
ADAPTATION OF THE HUMAN ORGANISM TO THE REPEATED SHORT-TERM EXPOSURES TO A HOT ENVIRONMENT [ADAPTATSIIA ORGANIZMA CHELOVEKA K POVTORNYM KRATKOVREMENNYM VOZDEISTVIIAM ZHARKOI SREDY]
A. T. MARIANOVICH, V. D. BAKHAREV, V. S. BALANDIN, and V. G. NIKIFOROV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, July-Aug. 1985, p. 684-686. In Russian. refs

Eight healthy subjects were exposed for 2 hr to 49 C ecactly 1 yr after five such 2-hr exposures, and their heat tolerance (HT) was compared to that found in the experiment of the previous year (Bakharev et al., 1983). HT was measured according to the criteria of rectal temperature, perspiration and heart rate, and according to the subjective evaluation of health and work efficiency. While the physiological effects of heat exposure did not change after a one-year period, the psychological indices pointed to better tolerance to the latest heat exposure than was found in the experiments of the previous year. It is suggested that the reason for this psychological adaptation might be the recognition by the subjects of the transient nature of the effects of short-term heat exposures experienced during the previous experiment. I.S.

A86-10750
A STUDY OF FUNCTIONAL ASYMMETRY OF PAIRED ORGANS IN AIRCRAFT PERSONNEL [ISSLEDOVANIE FUNKTSIONAL'NOI ASIMMETRII PARNYKH ORGANOV U LITS LETNOGO SOSTAVA]
V. A. BODROV and A. G. FEDORUK Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), July 1985, p. 50-52. In Russian. refs

Motor and sensory indicators of functional asymmetry were analyzed in flying and ground-based aircraft personnel for the purpose of determining the importance of these criteria in the selection of future aviators. While most subjects in all groups exhibited right-side (R) vision, hearing, and hand dominance, the flying personnel showed a higher number of the R dominance in hearing. Comparison of trainees and differently qualified pilots has shown the highest incidence of R dominance in hearing, vision, and hand functions in pilots of the first class. When pilots were divided into a relatively infrequently erring (IE) and often-erring (OE) groups, the former pilots exhibited a higher incidence of R dominance of hand, vision, and hearing, while the pilots in the OE group had relatively higher incidence of left-side dominance, indicating the importance of these tests in selection of trainees. I.S.

A86-11750
A DIFFERENTIAL EVALUATION OF THE MECHANISM OF THE EFFECT OF NOISE ON THE EAR IN RELATION TO NOISE FREQUENCY CHARACTERISTICS (CLINICAL AND EXPERIMENTAL STUDY) [DIFFERENTSIROVANNYI PODKHOD K OTSENKE MEKHANIZMA DEISTVIIA SHUMA NA ORGAN SLUKHA V ZAVISIMOSTI OT EGO CHASTOTNYKH KHARAKTERISTIK /KLINIKO-EKSPERIEMNTAL'NOE ISSLEDOVANIE/]
B. V. SHISHOV (Leningadskii Sanitarno-Gigienicheskii Meditsinskii Institut, Leningrad, USSR) Vestnik Otorinolaringologii (ISSN 0042-4668), Sept.-Oct. 1985, p. 13-15. In Russian. refs

Experiments conducted on guinea pigs and factory workers to determine the effect of various noise frequencies on the ear are presented. The experimental conditions and procedures used on 102 six-eight-months-old guinea pigs are described. The animals were subjected to noise of 2000, 400, and 8000 Hz at 80-100 dB for four to six hours; the observed effects on the cochlea and on the nucleic acids are explained. A clinical test on 92 workers of a porcelain factory and 83 workers of a textile factory is described; the workers were exposed to the same frequencies and decibels as the guinea pigs. The effect of noise on auditory functions is examined. The correlation between the experimental and clinical data is explained. The results reveal that an increase in noise frequency causes a narrowing in the extent of changes toward the base of the cochlea, and that an increase in noise frequency by an octave causes a decrease in noise intensity by 5 dB. I.F.

A86-11833* National Aeronautics and Space Administration, Washington, D. C.
THE SKELETON IN SPACE
A. W. GOODE (London Hospital, England) and P. C. RAMBAUT (NASA, Washington, DC) Nature (ISSN 0028-0836), vol. 317, Sept. 19, 1985, p. 204, 205. refs

Calcium loss experience by astronauts under weightless conditions is discussed. I-125 photon absorption measurements on astronauts on the Apollo 14, 15, and 16 flights showed bone density decreases of 6.6 percent in one astronaut and 7.3 percent in another. The estimated total body calcium loss on Apollo 17 was 0.2 percent. The test results indicate that calcium losses occur mainly from the weight-bearing parts of the skeleton. Measures to counteract the losses include 'penguin' suits, maintenance of nutrient intakes at high levels, and extensive exercise on ergometer and treadmill. C.D.

A86-12362#
PRELIMINARY MEDICAL RESULTS OF THE 5-MONTH FLIGHT ONBOARD SALYUT-7-SOYUZ-T
E. I. VOROBEV, O. G. GAZENKO, E. B. SHULZHENKO, A. I. GRIGOREV, A. S. BARER et al. IN: International developments in space stations and space technologies; Proceedings of the Thirty-fifth Congress, Lausanne, Switzerland, October 7-13, 1984 . New York, AIAA, 1985, p. 209-215.
(IAF PAPER 84-184)

Two Soviet astronauts performed a long-term space flight during the time from June 27 to November 23, 1983. Medical investigations regarding the two men were performed during and after the flight. The investigations had the objective to acquire more data about the reaction of the human body to a prolonged exposure to weightlessness. The present paper is concerned with the preliminary results of the medical studies. Attention is given to the general characterization of the 150-day flight, a general characterization of the status of the crew, measurements conducted during lower body negative pressure tests, measurements made during exercise tests, the physiological and hygienic aspects of astronauts during extravehicular activity, biochemical examinations, and postflight examinations. The obtained data have demonstrated once again that man can efficiently and productively work in long-term space flights. G.R.

A86-12363#
PERIODISATION AND CLASSIFICATION OF ADAPTIVE REACTIONS OF MAN IN PROLONGED SPACE FLIGHTS
O. G. GAZENKO, E. B. SHULZHENKO, A. I. GRIGOREV, and A. D. EGOROV IN: International developments in space stations and space technologies; Proceedings of the Thirty-fifth Congress, Lausanne, Switzerland, October 7-13, 1984 . New York, AIAA, 1985, p. 216-225. refs
(IAF PAPER 84-185)

With respect to physiological changes, weightlessness appears to be the most important of various factors to which the human body is subjected during a space flight. The changes produced in the vital functions of the body during an exposure to weightlessness are considered, taking into account adaptive reactions and the time of their occurrence. It is found that the phase of completion of primary adaptive reactions (4-6 weeks in duration), is characterized by the further development of adaptive reactions and the recovery (partial or complete) of the final adaptive effects of certain functions. The period of relative stabilization of adaptation reactions represents the attainment of a new level with respect to the functioning of basic systems of the body. G.R.

A86-12376
AGE-RELATED AUGMENTATION OF PLASMA CATECHOLAMINES DURING DYNAMIC EXERCISE IN HEALTHY MALES
J. L. FLEG, S. P. TZANKOFF, and E. G. LAKATTA (NIH, Gerontology Research Center, Baltimore, MD) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1033-1039. refs

A86-12377
EFFECT OF HEAD-DOWN TILT ON BASAL PLASMA NOREPINEPHRINE AND RENIN ACTIVITY IN HUMANS
S. R. GOLDSMITH, G. S. FRANCIS, and J. N. COHN (Hennepin County Medical Center; U.S. Veterans Administration Medical Center; Minnesota, University, Minneapolis) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1068-1071. USVA-supported research. refs
(Contract NIH-HL-22977-03)

The effects of loading cardiopulmonary baroreceptors on basal norepinephrine and renin activity were studied in six normal human subjects. Loading of cardiopulmonary baroreceptors was accomplished by a 60-min 30-deg head-down tilt with small supplemental saline infusions. Central venous pressure was measured continuously by intrathoracic catheter; arterial pressure was measured indirectly by cuff. During the tilt, central venous pressure increased from 5.1 + or - 1.3 to 8.9 + or - 1.7 mmHg (P less than 0.001), whereas arterial pressure was unchanged. Plasma norepinephrine (185 + or - 85 pg/ml) and plasma renin activity (3.9 + or - 5.7 ng/ml h) did not change. Moderate sustained loading of cardiopulmonary barorcceptors is therefore without effect on unstressed plasma norepinephrine and renin activity in normal humans, suggesting that the tonic inhibitory effects of these receptors on these neurohumoral control systems are not readily increased in the basal state. Author

A86-12426#
MEDICAL REQUIREMENT FOR MANNED SPACE PROGRAMME
P. C. CHATTERJEE (Indian Air Force, New Delhi, India) Aviation Medicine, vol. 28, Dec. 1984, p. 102-106.

Medical requirements for manned space programs basically include freedom from clinical or subclinical diseases and absence of definite predisposition. The capability to withstand different stresses encountered during a spaceflight as produced by different simulators is also required. The system of selecting cosmonauts is being constantly improved, taking into account past experience, flight peculiarities, mission duration, and scientific tasks to be performed. Advancement in general medicine, biomedical engineering, space medicine, and medical experimentation, both inflight and postflight, constantly updates the system. Author

A86-12427#
MEDICAL EVALUATION OF COSMONAUTS - PHYSIOLOGICAL STRESS TESTING
M. B. DIKSHIT, P. K. BANERJEE, J. S. KULKARNI, E. M. IYER (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), and M. M. SINGH (Air Force Central Medical Establishment, New Delhi, India) Aviation Medicine, vol. 28, Dec. 1984, p. 107-115. refs

The physiological stress testing of cosmonauts is examined. The means of assessing the ability of an individual to withstand zero gravity and recover, and the effects of zero gravity on the cardiovascular and renal systems are discussed. The testing of lung capacity using a spirometry is explained. The use of bicycle ergometry tests to evaluate physical fitness by monitoring heart rate, blood pressure, and ventilation is explained. Orthostatic tolerance was measured using tilt table tests and cardiovascular reflex responses were determined by cold pressure tests; these tests are described and the results are tabularly presented. The possible disadvantage of high endurance physical capacity during space flights is explained. The addition of heat balance studies to the evaluation of cosmonauts is discussed. I.F.

A86-12428#
MEDICAL EVALUATION OF COSMONAUTS - CARDIOVASCULAR ASSESSMENT
V. M. ALURKAR (Indian Air Force, Command Hospital, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 116-120.

A high level of functional efficiency of the cardiovascular system is essential for space flight. The considerable increase in G force during launch, weightlessness during orbital flight, and physiological readjustments during reentry are the main stresses affecting the cardiovascular system. Hence special emphasis is laid on ruling out any underlying heart disease by a thorough clinical, biochemical, radiological, and electrocardiographic examination. ECG at rest and on stress testing are especially useful. Echocardiographic examination has been extremely useful in the diagnosis of IHSS, MVP, and bicuspid aortic valve which could have been undetected earlier. Author

A86-12429#
MEDICAL EVALUATION OF COSMONAUTS - ASSESSMENT OF VESTIBULAR SYSTEM
S. P. DESHMUKH (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 121-127. refs

The testing of cosmonauts to evaluate their vestibular system is examined. The four tests, functional, provocative, adaptive capacity, and simulation, used to evaluate vestibular performance are described. The testing of the candidates included: an otolithic reaction test, Khilov's swing test, continuous cumulative coriolis acceleration, and discontinuous cumulative coriolis acceleration. The apparatuses, test procedures, and results are explained. The chart used to grade the vestibular reaction of the cosmonauts to the tests is provided. Additional basic vestibulometric tests performed are listed. I.F.

A86-12430#
MEDICAL EVALUATION OF COSMONAUTS - 'ACCELERATION'
K. RAI and M. N. GUPTA Aviation Medicine, vol. 28, Dec. 1984, p. 128-132.

Large acceleration stresses are encountered by cosmonauts at different phases of space flight. Their magnitudes and durations are discussed highlighting certain physiological effects to determine tolerance limits. During launch and re-entry the choice of supine G has been explained. The acceleration test profiles used at IAM for cosmonaut evaluation with results of 9 subjects have been presented. Author

A86-12432#
DENTAL EVALUATION OF COSMONAUTS
Y. P. KAPOOR (Indian Air Force, Dental Centre, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 140-144. refs

The stomatoscopy, electro-odonto-diagnostics and thermal test, and stomatological investigation used in the dental evaluation of cosmonauts are described. The procedures involved in the clinical examination of the oral cavity are discussed. Explanations of the problems with individual teeth, which include dental caries, attrition, abrasion, tooth mobility, migration of teeth, overbite, open bite, and cross bite are provided. The examination of the alveolar mucosa and gingiva is described. The periodontium is observed for periodontal pockets and the temporomandibular joint is examined for any irregularities. The second step in the dental evaluation includes electro-odonto-diagnostics and a thermal test. The use of the electric pulp tester, which indicates the vitality or nonvitality of the pulp, combined with the thermal test is examined. Possible dentofacial abnormalities are observed with an orthopantograph of the skull. The dental standards for successful completion of the examination are discussed. I.F.

A86-12433#
MEDICAL EVALUATION OF COSMONAUTS - BIOCHEMICAL INVESTIGATIONS
S. K. ADAVAL (Indian Air Force, Command Hospital, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 145-150. refs

The use of biochemical tests to evaluate the fitness of a cosmonaut and to discover any latent pathology is described. The three stages of biochemical testing which include the initial assessment of fitness, the hospital evaluation, and the final examination are explained. The biochemical tests conducted are presented; emphasis is placed on cardiovascular fitness and blood lipids. The hematological changes, which include loss of red blood cells, that occur during space flight are described and explanations for these effects are proposed. The loss of bone and muscular

substance and muscular atrophy due to calcium loss and a negative balance of potassium and nitrogen are explained. The effect of space flight on the metabolic process is examined. The study of interferon and human lymphocytes in order to improve an individual's immunological protection is discussed. I.F.

A86-12434#
EEG STUDIES IN EPISODIC UNCONSCIOUSNESS, SEIZURE DISORDER AND SYNCOPE
K. R. BANERJEE (Indian Air Force, Command Hospital, Bangalore, India), J. S. KULKARNI (Air India, Bombay, India), and J. M. WADHAWAN (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 151-157. refs

The study of clinical epilepsy and syncope in 524 subjects, in order to compare the usefulness of a clinical diagnosis and an EEG diagnosis and to determine the effect of routine provocative techniques, is discussed. The EEG recording procedure and the use of hyperventilation and photic simulation are described. The evaluation criteria which is divided into normal, borderline, and abnormality are explained. The results which reveal distributions as per age, sex, history, with and without hyperventilation and photic stimulation, and of the morphology and type of electrical discharge of abnormal EEG are tabularly presented. The results, which correlate well with previous studies, are explained and the importance of family history in interpreting an EEG is discussed. The results indicated that a clinical diagnosis is more useful than EEG diagnosis in determining epilepsy and syncope. I.F.

A86-12435#
AIRSICKNESS AMONG INDIAN AIRLINES PASSENGERS
K. S. VERMA (Indian Airlines, New Delhi, India) Aviation Medicine, vol. 28, Dec. 1984, p. 158-161. refs

N86-10739# Joint Publications Research Service, Arlington, Va.
HEMODYNAMICS DURING GRAVITATIONAL OVERLOADS (MATHEMATICAL MODELING) Abstract Only
B. L. PALETS, A. A. POPOV, M. A. TIKHONOV, and D. Y. ARKHANGELSKIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 1 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2, Mar. - Apr. 1985 p 185-191 Original language document announced in IAA as A85-33952
Avail: NTIS HC A06

A mathematical model is developed for the regulation of human blood circulation under +Gz acceleration in the head-pelvis direction. A digital-computer study of the model shows that it is adequate to experimental data with respect to indices of systemic hemodynamics in the entire +Gz acceleration range up to the tolerance limit. Regulatory processes detemining changes in the central blood volume are shown to play an important role in the pattern of circulation response to +Gz acceleration; the role of active venomotor responses is relatively small. B.J. (IAA)

N86-10740# Joint Publications Research Service, Arlington, Va.
STUDY OF HYPOKINESIA AND ACCELERATION EFFECTS ON HUMAN CHROMOSOMES Abstract Only
N. N. BOBKOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 1 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2, Mar. - Apr. 1985 p 300-302
Avail: NTIS HC A06

A thirty-day antiorthostatic hypokinesia with an -8 deg angle to horizontal position followed by laterally-directed 8 g accelerations for 40 s did not lead to any chromosomal damage in peripheral blood lymphocytes of adult subjects with arthereosclerosis and vegetative vascular dystonia. E.A.K.

N86-10743# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF CHANGES OF STATISTICAL INDICATORS OF HEART RHYTHM OF PERSONS WITH DIFFERENT DEGREE OF MOTION SICKNESS Abstract Only
S. S. MARKARYAN, A. V. IGREVSKIY, and Y. A. KOROTKOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 46 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 157-158
Avail: NTIS HC A06

The possibility of using variation pulsometry to reveal latent forms of motion sickness, in seamen who participate in long voyages was studied. It was shown that this procedure could detect latent motion sickness in seamen. It is found that there are definite differences of adaptation to motion sickness in persons with different levels of resistance of Coriolis acceleration. Subjects resistant to vestibular effects revealed only a slight tendency toward insignificant changes of heart rhythm. E.A.K.

N86-10744# Joint Publications Research Service, Arlington, Va.
EFFECT OF SINGLE ACTIONS OF WEAK ELECTROMAGNETIC FIELDS OF ULTRALOW FREQUENCY ON INDICES OF ENDOCRINE SYSTEM Abstract Only
Y. A. ZAGORSKAYA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 50 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2, Mar. - Apr. 1985 p 293-299
Avail: NTIS HC A06

Functions of the human endocrine system was studied after a single exposure to weak electromagnetic field of ultralow frequency with a tension close to the real geomagnetic background and one approaching the alpha rhythm of human EEG. A single 5 hr exposure of healthy male subjects led to decreased activity of hypophysis-adrenal system manifested by lower levels of urinary 17-keto steroids, lower plasma cortisol and corticosterone and increased ACTH levels, accompanied by increased levels of circulating blood testosterone which in some cases exceeded the normal physiological range. Increased levels of TSH and free and total thyroxin in blood was noted in some subjects. The findings represent adaptable compensatory reactions of the regulatory systems showing that this system is highly sensitive to the effect of a magnetic field. E.A.K.

N86-10746# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF STATE OF CHRONOTROPIC AND INOTROPIC HEART FUNCTION AT DIFFERENT DEGREES OF PHYSICAL FITNESS Abstract Only
V. V. AKSENOV and I. G. TAZETDINOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 62-63 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 96-101 Original language document announced in IAA as A85-27781
Avail: NTIS HC A06

An approach to the mathematical analysis of cardiosignals is developed which makes it possible to quantitatively evaluate the chronotropic and inotropic functios of the heart from a systems point of view. Combining statistical, cross-correlation, and frequency analyses, this approach makes it possible to assess physical-training level in aerospace and sports medicine. As an example, cardiosignals from the flight commanders and engineers on the Salyut-5 and Salyut-6 orbital stations were analyzed. It is concluded that the mathematical analysis of cardiosignals recorded in conditions of rest makes it possible to evlauate physical-training level as the potential readiness of regulatory systems to provide for the required high level of body functioning under physical loads. B.J. (IAA)

N86-10747# Joint Publications Research Service, Arlington, Va.
CAPACITY FOR WORK AND HEMODYNAMICS IN MALES RESIDING AT MIDDLE AND HIGH LATITUDES Abstract Only
L. N. MATVEYEV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 63 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 113-120
Avail: NTIS HC A06

The reaction of the cardiovascular system to physical exertion of various intensity was studied. Fitness for physical work of nonindigenous population of the Northeast is closely associated with length of stay in the North. Performance of work analogous to that performed by men from Moscow produces a significant hyperenergic reaction of the cardovascular system. Persons staying in the North for up to 5 years have adequate metabolic requirements from hyper-dynamia which provides adequate capacity for physical work and rapid recovery rates but a stay of more than 5 years gives lesser capacity for phyiscal work and slowing of recovery rates, due to an approach to the limits of adaptational capacities of the cardiovascular system. Men born in the North have some limitation on their capacity for physical work but have rather rapid recovery rates, indicating a whole complex of adaptational changes. E.A.K.

N86-10748# Joint Publications Research Service, Arlington, Va.
INDIVIDUAL TYPOLOGICAL FEATURES OF AUTONOMIC REACTIONS DURING AUTOGENIC TRAINING IN POLAR EXPEDITION MEMBERS IN PERIOD OF WINTERING IN ANTARCTICA Abstract Only
Y. A. SIDOROV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 64 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 121-128
Avail: NTIS HC A06

Subjects at a coastal Antarctic station underwent autotraining sesions in individual rooms, seated in a comfortable position. Autotraining sessions to achieve relaxation were most effectiv in the expedition members with average or low level of adaptive plasticity, beginning in the second half of wintering at the station. Intersystem inter-relationships of central and peripheral links for providing adaptive reconstructions during autotraining of the expedition members depended on individual parameters of cerebral neurodynamics. Autotraining proved to be an adequate nonmedical method for preventing and correcting disadaptational disturbances in the expedition members during their stay in Antarctica. Individual differences in the plasticity of neurodynamic processes determine the nature of autonomic reactions of the body to autotraining. E.A.K.

N86-10749# Joint Publications Research Service, Arlington, Va.
EFFECT OF INCLUSION OF SUPPLEMENTARY ASCORBIC ACID IN DAILY DIET ON DEGREE OF VITAMIN SATURATION OF BODY AND THERMORESISTANCE OF ERYTHROCYTES WHILE WORKING IN ARID ZONE Abstract Only
I. M. MOMMADOV, V. A. GRAFOVA, and G. A. TUPIKOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 64-65 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 129-133 Original language document announced in IAA as A85-27786
Avail: NTIS HC A06

The physiological needs for ascorbic acid and of the effect of vitamin C supplements at the rate of 150 mg/day on human resistance to heat in arid zones were studied. Ascorbic acid sufficiency was determined by its level in the fasting morning urine. Subjects ate a dragee containing 50 mg of ascorbic acid 3 times a day immediately after meals which increased the vitamin C level in the morning urine. The 150 mg/day dosage normalized the studies ascorbic acid level. The vitamin C supplement increases erythrocytes resistance to heat when working in high temperatures with high insolation. E.A.K.

N86-10750# Joint Publications Research Service, Arlington, Va.
EFFECT OF VARIOUS DOSES OF SOME VITAMINS ON NON-SPECIFIC MECHANISMS OF ADAPTATION OF MAN Abstract Only
V. S. NOVIKOV and V. N. BORTNOVSKIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 65 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 134-137 Original language document announced in IAA as A85-27787
Avail: NTIS HC A06

An experimental study was conducted to investigate the effect of vitamin additions on the state of the vascular system in the nonspecific resistance of the body in persons working in unfavorable environmental conditions. Thirty operators 19 to 23 years of age were studied whose work was characterized by high work strain, hypokinesia, and environmental discomfort (e.g., high air temperature). One group of 10 subjects received the following vitamins daily: retinol acetate (0.00172 g), thiamine bromide (0.0026 g), riboflavin (0.002 g), nicotinamide (.015 g) pyridoxin hydrochloride (0.002 g), and ascorbic acid (0.07 g). A second group of 10 subjects received a double dose of the same vitamins, while a third group (the control) received placebos. Administration of the vitamins in a double dose was found to prevent the development of deadaptive changes. It is concluded that vitamin additions can prevent a reduction in the nonspecific resistance of the body under extreme environmental conditions. E.A.K.

N86-10751# Joint Publications Research Service, Arlington, Va.
ADAPTATION OF MAN TO EXTREME CONDITIONS OF ANTARCTICA Abstract Only
S. I. SOROKO, A. L. MATUSOV, and Y. A. SIDOROV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 66 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 10, no. 6, Nov. - Dec. 1984 p 907-920
Avail: NTIS HC A06

An effort is made to clarify the problem of human adaptation to Antarctic conditions on the basic of multiyear complex ecological-physiological studies. These studies include the investigation of: (1) the ecological factors (natural and anthropogenic) of Antarctica; (2) individual features of the adaptive plasticity of central and vegetative mechanisms of regulation under various factors of the winter stay; (3) the dynamics of analyzer systems; (4) the work capacity of polar workers; (5) the psychoneural status of workers; and (6) the health of expedition members. It is concluded that the complex of extreme factors of Antarctica makes severe demands on the nervous, vegetative, and psychoemotional elements of human beings, calling forth all the reserve capacities of the body. B.J. (IAA)

N86-10752# Joint Publications Research Service, Arlington, Va.
INDIVIDUAL TYPOLOGICAL SELF-REGULATION OF CARDIO-VASCULAR SYSTEM Abstract Only
Y. G. VASHCHILLO, M. A. KONSTANTINOV, and D. N. MENITSKIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 67 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 10, no. 6, Nov. - Dec. 1984 p 929-936 Original language document announced in IAA as A85-19936
Avail: NTIS HC A06

New data are reported pertaining to individual expological differences in the guided self-regulation of heart rate (HR) and arterial pressure (AP) in a visual feedback tracking study. Particular attention is given to individual differences in the latency of effects from baroreceptors at different levels of CNS regulation, these differences being manifested in differences in the amplitude-phase characteristics of guided oscillations of HR and AP rhythms with respect to a sinusoidal control signal. It is concluded that the proposed technique can be used as a training tool in alternating-load exercise and to study the possibility of destabilizing a regulation system with the aim of changing its state. Author

N86-10753# Joint Publications Research Service, Arlington, Va.
CONDITIONING POTENTIALITIES OF RESPIRATORY APPARATUS Abstract Only
F. T. AGARKOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 69 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 10, no. 6, Nov. - Dec. 1984 p 981-987
Avail: NTIS HC A06

The temperature of expired alveolar air sublingual, axillary and rectal temperature with temperature of the environment at -30 up to +30 C +50, +60 and +70 C in a heat chamber. Temperature of expired alveolar air at the height of maximally deep exhalation has the same value. Heat or cold, disturbing the isothermy, caused destabilization and an increasing change of the temperature of exhaled alveolar air. Exogenous heat effects disturb isothermy of the organism and destabilize the temperature of the alveolar air. Factors which limit the conditionaing potentials of the respiratory apparatus in the presence of intense heat include the air temperature, the air humidity and developing hypothermia, the degree of pronouncement of which determines the degree of increase of temperature of the alveolar air, to the greatest extent. It is assumed that the respiratory apparatus is not an ideal conditioner and the existing idea about the constancy and the conformity of the temperature of the alveolar air to the temperature of the core of the body is reconsidered. E.A.K.

N86-10755# Joint Publications Research Service, Arlington, Va.
CLASSIFICATION OF CHANGES IN ELECTROCARDIOGRAM DURING MUSCULAR EXERTION OF HEALTHY INDIVIDUALS Abstract Only
A. I. ZAVYALOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 73 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2., Mar. - Apr. 1985 p 201-207
Avail: NTIS HC A06

The determination of human endurance during physical stress is one of the most important tasks in aviation, space, work and in sport physiology. Bodily fuctioning depends on the cardio-respiratory system and evaluation of the myocardium during exertion is achieved by study of the electric activity of the heart. The dynamics of EKG were studied on subjects while applying various stress loads. Advanced athletes and sedentary individuals were examined during exercise and in rest periods. Telemetric and conductive EKG seismography, photoplethysmography and arterial pressure were studied. The data statistically leading to comparative analysis was analyzed. Appearance of overstress signals on EKG was accompanied by decreased frequency of heart contractions, a drop in systolic arterial pressure, lowered blood supply, decreased amplitude of seismocardiac signals and of the photoplethysmography wave, indicating a disorder in the contractural function of the myocardium. E.A.K.

N86-10756# Joint Publications Research Service, Arlington, Va.
EYE-MOVEMENT ACTIVITY AS INDEX OF FUNCTIONAL STATE OF BRAIN Abstract Only
Y. D. KHOMSKAYA and I. V. YEFIMOVA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 73 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2., Mar. - Apr. 1985 p 235-240
Avail: NTIS HC A06

Two types of eye movements slow or tracing movements and fast, saccadic movements with different control mechanisms were studied. Rhythmic saccadic eye movements were studied in relationship to mental fatigue which develops during the day and the characteristics of eye movements in individuals with varying degree of motor activity. A definite correlation between the parameters of eye movement reactions and general motor activity of the subjects with their functional state was found. Fatigue and emotional stress resulted in increased frequency of eye movements especially in the more sedentary individuals. It is suggested that eye movement reactions could be used as diagnostic tools in determining the functioning state of the brain. E.A.K.

N86-10757# Joint Publications Research Service, Arlington, Va.
MECHANISM OF ADAPTOGENIC ACTION OF PRICKLY ELEUTEROCOCCUS ON MAN DURING HEAT STRESS Abstract Only
G. N. NOVOZHILOV and K. K. SILCHENKO *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 74 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2., Mar. - Apr. 1985 p 303-306 Original language document announced in IAA as A85-33964
Avail: NTIS HC A06

The application of eleutherococcus extract in the course of 10 days prior to applied heat stress was found to have a favorable effect on body thermoregulation; body temperature was 0.73 C lower in test subjects than in the control group. However, a high biological cost for the heat adaptation was observed, expressed in two effects: (1) a significantly higher energy cost of enhanced thermal stability under eleutherococcus administration than in the control group; and (2) a more pronounced mobilization of proteins, manifested in the growth of the fraction of protein consumed in the energy metabolism and in a higher level of excretion of nitrogen compounds in the sweat and urine. Author

N86-10758# Joint Publications Research Service, Arlington, Va.
VESTIBULAR RESISTANCE AND BLOOD CIRCULATION CHANGES IN ORTHOSTATIC POSITION DURING HYPERTHERMIA Abstract Only
V. I. SOBOLEVSKIY *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 74-75 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2., Mar. - Apr. 1985 p 327-330
Avail: NTIS HC A06

Vestibular and orthostatic stability of the body under various environmental conditions in applied human physiology especially under conditions of progressive exogenic hyperthermia was studied. Thermogenic changes of arterial pressure, volume of circulating blood and peripheral resistance were studied in gravitational and vestibular loads. It was shown that with limited internal hyperthermia the vestibular and orthostatic stabilities of men are unaffected. The principal mechanism of lowering resistance to vestibular and gravitational irritants is the disturbance in the blood circulating system and in cardiac activity. E.A.K.

N86-10759# Joint Publications Research Service, Arlington, Va.
HEAT TRANSFER MECHANISM IN HUMAN EXTREMITIES Abstract Only
T. G. RAYGORODSKAYA, V. N. KOSHELEV, and O. L. PERTSOV *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 75 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 2., Mar. - Apr. 1985 p 336-338
Avail: NTIS HC A06

The possible effects of conductive and convective forms of heat transfer on the formation of the skin temperature field in the lower extremities during exercise of the muscles are assessed by a comparison of experimental data with numerical results obtained on the basis of the mathematical model of Koshelev and Pertsov (1978). Results indicate that the role of heat conduction in the transfer of heat from deep muscles to extremity surfaces is insignificant, while most of the hat dissipation in the tissues and heat transfer to the surfaces occurs convectively. B.J. (IAA)

N86-10765# Joint Publications Research Service, Arlington, Va.
TV MONITORING CONTROL SYSTEM IN ELECTROPHYSIOLOGICAL STUDIES Abstract Only
Y. G. KRATIN, Y. P. POPECHITELEV, A. N. SOLOVYEV, and Y. I. BUCH *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 78 18 Sep. 1985 Transl. into ENGLISH from Fizinl. Zh. SSSR Im. I. M. Sechenov (Leningrad), v. 71, no. 3, Mar. 1985 p 381-383
Avail: NTIS HC A06

In electrophysiological experiments and during determination of EEG curves, the flow of formation must be filtered to isolate most important indices to be able to follow the functional state of

the brain. A special monitor was constructed which consists of a TV camera, video-control unit and an image synthesizer consisting of synchronous impulse selector, round figure contructor and a coloring block. The degree of brain activity is converted to the background color scheme, to study the subject concurrently with the observation of brain activation. This apparatus can be modified for other clinical applications. E.A.K.

N86-10768* National Aeronautics and Space Administration, Washington, D. C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 275)
Sep. 1985 99 p
(NASA-SP-7011(275); NAS 1.21:7011(275)) Avail: NTIS HC $7.00 (special price) CSCL 06E

This bibliography lists 321 reports, articles, and other documents introduced into the NASA scientific and technical information system in August 1985. E.A.K.

N86-10769 Maryland Univ., College Park.
DETERMINATION OF SYMMETRY AND PHASE IN HUMAN VISUAL RESPONSE FUNCTIONS: THEORY AND EXPERIMENTS Ph.D. Thesis
D. G. STORK 1984 189 p
Avail: Univ. Microfilms Order DA8510459

Several mathematical and experimental techniques to deduce the temporal impulse response and static line spread function of the human visual system were employed. The problem of linearity in the visual system near threshold is recieved and the mathematical foundations of different experimental approaches are discussed. It is found that the method of constant (threshold) output avoids certain difficulties associated with other methods. The use of harmonic stimuli in vision, and the inherent phase or symmetry ambiguities associated with it are described. Physiological data on cat responses are analyzed. It is demonstrated that a spatially antisymmetric line spread function explains this data better that a spatially symmetric one. A novel stimulus segconverging and diverging stimuli is introduced and show how it can be used to probe spatial symmetry of the line spread function.It is demonstrated that the sensitivity to converging and diverging stimuli are equal. It is shown that adaptation to velocity stimuli at one retinal position can affect (reduce) sensitivity at spatially separated positions. Dissert. Abstr.

N86-10770*# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Service.
STRENGTH MODELING REPORT
N. I. BADLER, P. LEE, and S. WONG 30 May 1985 79 p refs
(Contract NAS9-16634)
(NASA-CR-171896; NAS 1.26:171896) Avail: NTIS HC A05/MF A01 CSCL 06P

Strength modeling is a complex and multi-dimensional issue. There are numerous parameters to the problem of characterizing human strength, most notably: (1) position and orientation of body joints; (2) isometric versus dynamic strength; (3) effector force versus joint torque; (4) instantaneous versus steady force; (5) active force versus reactive force; (6) presence or absence of gravity; (7) body somatotype and composition; (8) body (segment) masses; (9) muscle group envolvement; (10) muscle size; (11) fatigue; and (12) practice (training) or familiarity. In surveying the available literature on strength measurement and modeling an attempt was made to examine as many of these parameters as possible. The conclusions reached at this point toward the feasibility of implementing computationally reasonable human strength models. The assessment of accuracy of any model against a specific individual, however, will probably not be possible on any realistic scale. Taken statistically, strength modeling may be an effective tool for general questions of task feasibility and strength requirements. G.L.C.

N86-10771# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
THE EFFECTS OF AGE, SLEEP DEPRIVATION, AND ALTITUDE ON COMPLEX PERFORMANCE
H. W. MERTENS and W. E. COLLINS May 1985 22 p
(AD-A156987; AD-E950724; FAA-AM-85-3) Avail: NTIS HC A02/MF A01 CSCL 06S

Little research has been concerned with the combined effects on performance of age, sleep deprivation, and altitude. This study examined their potential interaction with laboratory tasks measuring aviation-related psychological functions. Healthy men in two age groups, 30-39 yr (N=16) and 60-69 yr (N=14), were evaluated for complex (time-shared) performance in the four possible combinations of two altitudes (ground level vs. 3,810 m (12,500 ft)) and two sleep conditions (sleep permitted vs. sleep deprived). Following training, performance was evaluated during 3-h test sessions in the morning and afternoon of each of 4 test days. Complex performance, measured by the Multiple Task Performance Battery (MTPB), included: monitoring of warning lights and meters, mental arithmetic, problem solving, target identification, and tracking. Workload was varied within each hour by varying the tasks performed simultaneously. Performance was significantly lower in the older subjects, but age did not interact significantly with sleep deprivation or altitude. When subjects were rested, altitude had no effect. When subjects were sleep deprived, performance was significantly lower in general, and the greatest decrement in performance occurred at altitude. Increasing workload enhanced the interaction of sleep deprivation and altitude. The performance of older subjects tended to be more affected by increases in workload, but decrements induced by sleep deprivation and altitude did not appear to interact with age. These findings provide empirical evidence in support of warnings in the aeromedical literature concerning greater effects of sleep deprivation as altitude increases within the general aviation range. GRA

N86-10772# Pacific Northwest Lab., Richland, Wash.
APPROACHES TO QUANTITATIVE EXPRESSION OF DOSE RESPONSE
E. S. GILBERT Apr. 1985 16 p refs Presented at the Symp. on Epidemiol. and Health Risk Assessment, Columbia, Md., 14 May 1985
(Contract DE-AC06-76RL-01830)
(DE85-013498; PNL-SA-13193; CONF-850577-1) Avail: NTIS HC A02/MF A01

Quantifying risks experienced by populations been exposed to relatively low levels of harmful agents for substances are discussed. DOE

N86-10773# Hauptverband der Gewerblichen Berufsgenossenschaften, e. V., Bonn (West Germany).
REPORT ON THE RESEARCH ACTIVITIES ON WHOLE-BODY VIBRATIONS. HUMAN STRAIN DUE TO MECHANICAL VIBRATIONS [BEANSPRUCHUNG DES MENSCHEN DURCH MECHANISCHE SCHWINGUNGEN. KENNTNISSTAND ZUR WIRKUNG VON GANZ-KOERPER-SCHWINGUNGEN]
H. DUPUIS (Mainz Univ., West Germany) and G. ZERLETT (Rheinische Braunkohlenwerke AG) May 1984 148 p refs In GERMAN
(ISBN-3-88383-107-7) Avail: NTIS HC A07/MF A01

Knowledge of whole-body vibration effects on man was surveyed to give authorities a guide for decision-making and judgement regarding occupational problems. The acute effects of mechanical vibrations on man's organism and physiological functions are reported as well as the chronic effects of whole-body vibrations and the influence of specific strain factors. Prevention measures are listed together with West German legislation and guidelines regarding the protection against mechanical vibrations at work. Author (ESA)

N86-10774# Amsterdam Univ. (Netherlands). Lab. voor Medischefysica.
VARIABILITY ANALYSIS OF VISUALLY INDUCED RESPONSES IN THE MIDST OF NOISE Ph.D. Thesis [VARIABILITEITS ANALYSE VAN VISUEEL OPGEWEKTE RESPONSIES TE MIDDEN VAN RUIS]
M. F. VANLOON Apr. 1984 91 p refs In DUTCH
(B8564052) Avail: NTIS HC A05/MF A01

The variability of EEG responses to visual stimuli, and possible relations between variations in latency and amplitude are investigated. A matched filter to detect and estimate the magnitude of variabilities on series of recordings until a 20% signal to noise ratio is reached was applied to responses of two subjects. Measurements show that in case of variability no relation exists between stimulus and the magnitude of the variability in latency or amplitude. Variability seems mainly to depend on the condition of the subject. Author (ESA)

N86-11838*# Rhode Island Univ., Kingston. Dept. of Physics.
FIBER OPTIC PRESSURE SENSORS IN SKIN-FRICTION MEASUREMENTS Final Report
R. KIDWELL Sep. 1985 57 p refs
(Contract NAG1-519)
(NASA-CR-176294; NAS 1.26:176294) Avail: NTIS HC A04/MF A01 CSCL 06B

Fiber optic lever pressure sensors intended for use in a low speed wind tunnel environment were designed, constructed and tested for the measurement of normal and shear displacements associated with the pressures acting on a flat aluminum plate. On-site tests performed along with several static and dynamic measurements made have established that, with proper modifications and improvements, the design concepts are acceptable and can be utilized for their intended use. Several elastomers were investigated for use in sensors and for their incorporation into these sensors. Design and assembly techniques for probes and complete sensors were developed. Author

N86-11839# American Inst. of Biological Sciences, Arlington, Va.
ASSESSMENTS AND VIEWPOINTS ON THE BIOLOGICAL AND HUMAN HEALTH EFFECTS OF EXTREMELY LOW FREQUENCY (ELF) ELECTROMAGNETIC FIELDS: COMPILATION OF COMMISSIONED PAPERS FOR THE ELF LITERATURE REVIEW PROJECT Final Report
May 1985 469 p
(Contract N00014-84-C-0446)
(AD-A156942) Avail: NTIS HC A20/MF A01 CSCL 06R

The biological and human health effects of extremely low frequency (ELF) electromagnetic fields are discussed. Among the topics discussed are: The effects of ELF fields on neural development and nerve regeneration; electromagnetic fields and calcium efflux; studies of plants and animals exposed to ELF electric and magnetic fields; electromagnetic influences on birds; a review of Cell Effects Induced by Exposure of Extremely Low Frequency electromagnetic fields; the effects of ELF electric and magnetic fields on artificial cardiac pacemakers; behavioral toxicology of ELF electric and magnetic fields; electromagnetic fields and public health; influence of power frequency electric and magnetic fields on human health; ecological effects of extremely low frequency electric and magnetic fields; reproductive and developmental alterations associated with exposure of mammals to ELF (1 to 300 Hz) electromagnetic fields; behavioral effects extremely low frequency electric and magnetic fields; effects of electromagnetic fields on circadian rhythms; effects of ELF electromagnetic fields on neuroendocrine systems; immunological effects of extremely low frequency electromagnetic fields; neural effects of extremely low frequency fields as a function of induced tissue current density; magnetic and electromagnetic field effects on biological systems; and effects of extremely low frequency electric and magnetic fields on the nervous system are discussed. GRA

N86-11840# Army Research Inst. of Environmental Medicine, Natick, Mass.
PERCEPTUAL AND PHYSIOLOGICAL RESPONSES DURING EXERCISE IN COOL AND COLD WATER
M. M. TONER, L. L. DROLET, and K. B. PANDOLF Jun. 1985 23 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A157334; USARIEM-M-32/85) Avail: NTIS HC A02/MF A01 CSCL 06S

This investigation examined the interaction of exposure to cold water stress with both perceived exertion and thermal sensation (TS) during exercise. Eight male volunteers performed arm, leg and combined arm and leg exercise for 45 min in water at 20 and 26 C. Exercise was performed at a low and a high intensity relative to the ergometer specific peak oxygen uptake (VO2 peak). In general, percent VO2 peak did not differ ($p > 0.05$) between types of exercise in either 20 or 26 C water. During low intensity exercise when power output was matched across water temperatures (Tw), percent VO2 peak was greater ($p < 0.05$) in 20 C water (52%) compared to 26 C water (42%). Ratings of perceived exertion (RPE) did not differ ($p > 0.05$) between Tw. During high intensity exercise when percent VO2 peak was matched across Tw, RPE was lower during exercise in 20 C compared to 26 C. Multiple correlation analyses comparing both final RPE and thermal sensation with physiological and thermal measures were performed across type of exercise and Tw. RPE was moderately correlated with heart rate and ventilation, whereas very slight relationships were established with TS, skin and rectal temperatures. TS was moderately correlated with skin and rectal temperatures whereas low correlations existed between TS and both heart rate and ventilation. These data suggest that the change in oxygen uptake associated with exercise in cold water does not add to the overall perception of exertion. This perception appears to be related to cardiopulmonary variables rather than thermal measures, whereas thermal sensation is related to thermal measures and not cardiopulmonary variables. GRA

N86-11841# Army Research Inst. of Environmental Medicine, Natick, Mass.
PHYSIOLOGICAL EFFECTS OF TRAINING
W. J. KRAEMER and W. L. DANIELS 25 Jun. 1985 44 p
(AD-A157417; USARIEM-M-31/85) Avail: NTIS HC A03/MF A01 CSCL 06P

With the evolution of exercise science a vast amount of information concerning the physiological effects of training has been generated. Understanding the basic training responses and adaptations of various modes of conditioning can give the clinician insights into exercise prescription. The purpose of this manuscript is not to present an exhaustive review, but provide the reader with a basic overview of the physiological effects of training. Aerobic training results in a number of adaptations in humans. The magnitude of this response is dependent upon a number of factors. It depends upon the type, the intensity, the frequency and the duration of the training; as well as the characteristics of the person undergoing training. In this section, we will discuss the physiological changes associated with the adaptation to training and how the characteristics of the individual and the training itself affect this adaptation. GRA

N86-11842# Oregon Univ., Eugene. Dept. of Psychology.
IS THE CEREBELLUM INVOLVED IN MOTOR AND PERCEPTUAL TIMING: A CASE STUDY Final Report
S. W. KEELE, D. L. MANCHESTER, and R. D. RAFAL 15 May 1985 21 p
(Contract N00014-83-K-0601)
(AD-A157452; TR-85-5-ONR) Avail: NTIS HC A02/MF A01 CSCL 06P

A model and a technique developed by Wing and Kristofferson (1973) decomposes variance of timing into that putatively due to a central timekeeper (a clock) and that due to implementation of movement through the motor system. A patient with unilateral cerebellar damage, when attempting to tap out a regular series of intervals, showed a large increase in timing variability for the left

hand compared to the right hand at target intervals of 550 msec. Application of the model suggested the increased variability was in the clock. Moreover, the patient appeared to have greater than normal difficulty in discriminating the durations of auditorially based time intervals. Earlier work (Wing, Keele, and Margolin, 1984) had suggested that basal ganglia damage in a Parkinson's patient also manifested itself as a clock disorder. The suggestion that clock variability arises from two different sources leads us to speculate that the brain's clock involves a circuit between several brain systems. These speculations are quite tentative because of interpretive problems with some of the data. GRA

N86-11843# Oregon Univ., Eugene. Dept. of Psychology.
FORCE AND TIMING COMPONENTS OF THE MOTOR PROGRAM Final Report
R. B. IVRY 15 May 1985 55 p
(Contract N00014-83-K-0601)
(AD-A157584; TR-85-3-ONR) Avail: NTIS HC A04/MF A01 CSCL 05J

Three experiments assess the effects of variations of force and time on response latency on both simple and choice reaction time. The first two experiments demonstrate that, while latency does not vary as a function of force, increasing timing demands by requiring that a response be maintained led to increases in reaction time. These results led to the development of a model of motor programming in which force and timing are dissociated as separate components. However, the data also indicated that the force component may be further analyzed into two subcomponents: force activation and force deactivation. The model predicts that the latter subcomponent may be programmed on-line provided sufficient time elapses between the implementation of the two subcomponents. The results of Experiment 3 support this prediction and further validate the proposed model. GRA

N86-11844# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
HEALTH HAZARD EVALUATION OF LIQUID MONOPROPELLANTS. PHASE 4. SUBCHRONIC INHALATION OF HYDROXYLAMMONIUM NITRATE, JANUARY 1985
19 Jul. 1985 24 p
(AD-A157623; USAEHA-75-51-0132-85) Avail: NTIS HC A02/MF A01 CSCL 06T

This study was conducted to determine the effects of repeated airborne exposures to animals of hydroxylammonium nitrate (HAN), a major component of liquid gun propellants. This evaluation will assist in advising on the potential health risks associated with handling these materials. Rats and dogs were exposed to aerosolized HAN for 90 days at concentrations of 300, 100, and 33 mg/cu m. Dose-related effects occurred in both species and were characterized in rats by weight loss and spleen and liver enlargement. In dogs, respiratory irritation and blood dyscrasia were the major toxic effects. Minimal effects were observed at the low dose, 33 mg/cu m. Personnel should be protected against all routes of HAN exposure since the systemic effects are additive. An airborne concentration of HAN at 3 mg/cu m may be considered as a basis for the development of a maximum allowable workplace atmosphere. Accidental exposures in man should be closely monitored for cyanosis, anemia and respiratory distress. Treatment for methemoglobinemia may be indicated. GRA

N86-11845# Pacific Northwest Lab., Richland, Wash.
DOSE DISTRIBUTION AND THE RELATIVE BIOLOGICAL EFFECTIVENESS OF INTERNAL ALPHA EMITTERS
D. R. FISHER, M. E. FRAZIER, and T. K. ANDREWS, JR. Mar. 1985 15 p refs Presented at the 9th Symp. on Microdosimetry, Toulouse, 20 May 1985
(Contract DE-AC06-76RL-01380)
(DE85-013041; PNL-SA-12638; CONF-850506-9) Avail: NTIS HC A02/MF A01

The influence of dose distribution at the cellular level on the relative biological effectiveness of internally deposited alpha-particle emitters were examined. Cultured Chinese Hamster Ovary (CHO-K1) cells were irradiated in vitro by insoluble ceramic microspheres of zirconium oxide labeled with (239)Pu. The absorbed dose and dose rate were held constant at 0.7 Gy and 0.17 Gy h(-1), respectively. Relative biological effectiveness (RBE) was evaluated using three endpoints: initial cell survival, mutation frequency, and primary DNA damage. Cell death was greatest for irradiations by sources of low specific activity. Mutation frequency was greatest for cells exposed to agitated sources and least for irradiation by stationary high-specific-activity sources. The amount of DNA damage increased at the alpha radiation was more uniformly distributed amongst the cells at risk. DOE

N86-11846# Brookhaven National Lab., Upton, N. Y.
THYROID ABSORBED DOSE FOR PEOPLE AT RONGELAP, UTIRIK AND SIFO ON MARCH 1, 1954
E. T. LESSARD, R. P. MILTENBERGER, R. A. CONRAD, S. V. MUSOLINE, J. R. NAIDU, A. MOORTHY, and C. J. SCHOPFER Mar. 1985 84 p refs
(Contract DE-AC02-76CH-00016)
(DE85-014695; BNL-51882) Avail: NTIS HC A05/MF A01

A study was undertaken to reexamine thyroid absorbed dose estimates for people accidentally exposed to fallout at Rongelap, Sifo, and Utirik Islands from the Pacific weapon test known as Operation Castle BRAVO. The study included: (1) reevaluation of radiochemical analysis, to relate results from pooled urine to intake, retention, and excretion functions; (2) analysis of neutron-irradiation studies of archival soil samples, to estimate areal activities of the iodine isotopes; (3) analysis of source term, weather data, and meteorological functions used in predicting atmospheric diffusion and fallout deposition, to estimate airborne concentrations of the iodine isotopes; and (4) reevaluation of radioactive fallout, which contaminated a Japanese fishing vessel in the vicinity of Rongelap Island on March 1, 1954, to determine fallout components. The conclusions of the acute exposure study were that the population mean thyroid absorbed doses were 21 gray (2100 rad) at Rongelap, 6.7 gray (670 rad) at Sifo, and 2.8 gray (280 rad) at Utirik. The overall thyroid cancer risk we estimated was in agreement with results published on the Japanese exposed at Nagasaki and Hiroshima. The major route for intake of fallout was by direct ingestion of food prepared and consumed outdoors. DOE

N86-11847# Lawrence Livermore National Lab., Calif.
PROSPECTS FOR DNA METHODS TO MEASURE HUMAN HERITABLE MUTATION RATES
M. L. MENDELSOHN 14 Jun. 1985 9 p Presented at the 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(Contract W-7405-ENG-48)
(DE85-014555; UCRL-92242; CONF-8506137-5) Avail: NTIS HC A02/MF A01

A workshop cosponsored by ICPEMC and the US Department of Energy was held in Alta, Utah, December 9 to 13, 1984 to examine the extent to which DNA-oriented methods might provide new approaches to the important but intractable problem of measuring mutation rates in control and exposed human populations. The workshop identified and analyzed six DNA methods for detection of human heritable mutation, including several created at the meeting, and concluded that none of the methods combine sufficient feasibility and efficiency to be recommended for general application. DOE

N86-11848# Maryland Univ., Baltimore.
ACUTE PULMONARY EFFECTS OF FORMALDEHYDE EXPOSURE IN HUMANS Progress Report, 1 Dec. 1983 - 30 Nov. 1984
Jul. 1985 6 p refs
(Contract DE-AS05-84ER-60192)
(DE85-014728; DOE/ER-60192/1) Avail: NTIS HC A02/MF A01

Nonsmoking subjects were randomly exposed at rest for 3 hours each to 0.0, 0.5, 1.0, and 2.0 ppM HCHO for establishing a dose-response curve at rest, and the effect of 2 ppM HCHO with moderate exercise with a 24-hr postexposure was evaluated. Results of exposure of the 10 subjects to the concentration are: (1) a significant or near significant decrease, compared to clean

air; (2) the FVC and FEV1 time courses of response showed no clear change in function over any 3-hour exposure from 0.0 to 2.0 ppM HCHO; and (3) including the 2.0 ppM HCHO exposure only mild symptoms were experienced. DOE

N86-11849# Oak Ridge National Lab., Tenn.
IMPROVEMENT IN WEAR PERFORMANCE OF SURGICAL TI-6AL-4V ALLOY BY ION IMPLANTATION OF NITROGEN OR CARBON
J. M. WILLIAMS, R. A. BUCHANAN, and E. D. RIGNEY, JR. Jun. 1985 10 p refs Presented at the Am. Soc. for Met. Conf. on the Appl. of Ion Plating and Implantation to Mater., Atlanta, 3 Jun. 1985 Prepared in cooperation with Alabama Univ., Birmingham
(Contract DE-AC05-84OR-21400)
(DE85-013986; CONF-8506139-1) Avail: NTIS HC A02/MF A01

The effects of ion implantations of either nitrogen or carbon on the corrosive wear performance of surgical Ti-6Al-4V alloy were investigated. In vitro tests made use of an apparatus which could produce certain chemical and mechanical aspects of a sliding interface such as that which occurs between alloy and polyethylene components of an artificial hip (or knee) joint. Cylindrical samples of the Ti alloy were rotated between loaded, conforming pads made of ultrahigh molecular weight polyethylene (UHMWPE) while these test components were immersed either in a saline solution or a saline solution with bovine serum added. During the tests open circuit corrosion currents for the alloy were measured by the Tafel extrapolation technique. Profilometry studies were done before and after the tests. Alloy samples implanted with either nitrogen or carbon remained as new for all test conditions. Unimplanted control samples were severely scored. Corrosion currents as measured under the mechanical action were reduced by a factor of approximately one hundred by the ion implantation treatments. DOE

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-10157
HUMAN PILOT PARAMETER IDENTIFICATION FOR A SIMULATED AIR-TO-GROUND TARGET ACQUISITION TASK
P. A. STUDER (Eidgenoessisches Militaerdepartement, Bern, Switzerland) International Journal of Modelling and Simulation (ISSN 0228-6203), vol. 5, no. 2, 1985, p. 41-46. refs

An experimented pilot is used to perform the acquisition of a ground-fixed target during a simulated air-to-ground attack with a combat aircraft. Target tracking error as well as pilot output are stored for off-line parameter identification of a pilot reference model. The identification method is derived from first order sensitivity functions to the model parameters. The runs are organized to distinguish the learning from the skilled phase adaptation of the pilot to the simulation. Author

A86-10258
BEHAVIORAL AIRSICKNESS MANAGEMENT PROGRAM FOR STUDENT PILOTS
D. A. GILES (USAF, School of Aerospace Medicine, Brooks AFB, TX) and G. K. LOCHRIDGE (USAF, Aerospace Medical Operations, Tinker AFB, OK) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 991-994. refs

The management of recurrent airsickness in student pilots has traditionally involved positive reinforcement of motivation and limited use of medication. The Behavioral Airsickness Management (BAM) program seeks to establish an effective behavioral and cognitive intervention format for managing airsickness symptoms. There were 37 student pilots experiencing recurrent airsickness who were exposed to an assessment and rehabilitation program designed to develop diaphragmatic breathing skills while rapidly reducing physiological tension via cue-evoked relaxation strategies. Cognitive modification techniques were also included in the treatment protocol. Of the 37 students, 35 were returned to their flying training program with no recurrences of the airsickness problems. Cross-validation evidence is offered, as well as hypotheses for the program's success. Author

A86-10260
THE IMPACT OF LIFE EVENTS ON PILOTS - AN EXTENSION OF ALKOV'S APPROACH
S. J. SLOAN and C. L. COOPER (University of Manchester Institute of Science and Technology, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 1000-1003. refs
(Contract AF-AFOSR-83-0148)

A re-examination is made of Alkov's (1980, 1981) questionnaire method of revealing the predictability of the effects of a pilot's 'life events' on the pilot's perception of event/processes relationships. The questions were designed to elicit pilot perceptions of a pilot who has a significant accident potential. The questionnaire was given to 442 British pilots, with the results subjected to a statistical analysis. The analysis revealed that the pilots viewed the questions as evaluating emotional gains and losses and pilot characteristics. It was concluded that the aspects of a pilot's psychological state must be interpreted more contextually, and therefore the questionnaire used can have only limited accuracy in evaluations of the fitness of a pilot for flight responsibilities. M.S.K.

A86-10261
THE EFFECTS OF MILD HYPOXIA ON A LOGICAL REASONING TASK
R. G. GREEN (Royal Air Force, Institute of Aviation Medicine, Farnborough, England) and D. R. MORGAN (Aircraft and Armament Experimental Establishment, Salisbury, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 1004-1008. refs

The initial performance of 150 humans in logical reasoning tests while experiencing mild hypoxia was assessed experimentally. The subjects were divided into three groups for the tests in a decompression chamber which simulated altitudes of 305, 2440, 3050 and 3660 m, respectively, with test scores being compared to those from a classroom setting. Both work speed and error rate were significantly affected by altitude. The error rate for the 3660 m altitude group was significantly higher than that of other groups. The decrement at 3660 m is concluded to support the results found by previous researchers with simulated higher altitudes. M.S.K.

A86-10493
OPENING UP THE ASTRONAUT SELECTION PROCESS
B. M. REGISTER Space World (ISSN 0038-6332), vol. V-9-261, Sept. 1985, p. 4-7.

The selection process for pilots, mission specialists, and payload specialists is discussed. NASA selects pilots and mission specialists from its thousands of applications, and payload specialists are chosen by the employer who has purchased space on a Shuttle launch. The requirements established by NASA for pilots and mission specialists are described. The three-stage selection process which involves completing applications, interviews, and physicals is explained. The qualifications of the present astronaut candidates are given. The training and functions of the payload specialists, who are chosen for their expertise in fulfilling mission objectives, are described. I.F.

A86-11147
SPATIAL-FREQUENCY MODEL FOR HYPERACUITY
C. R. CARLSON and R. W. KLOPFENSTEIN (RCA Laboratories, Princeton, NJ) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Oct. 1985, p. 1747-1751. refs

Humans can detect vernier displacements of two abutted lines that are 30 times smaller than the bar spacings that determine their grating acuity. Since vernier acuity tasks, and hyperacuity tasks in general, reveal such drastically improved sensitivity, it has been traditionally assumed that the detection mechanisms responsible for hyperacuity are fundamentally different from those underlying ordinary spatial acuity. The need for unusual mechanisms is reinforced by the observation that hyperacuity is weakly affected by changes in suprathreshold contrast, whereas ordinary acuity is strongly influenced by contrast. Nevertheless, it is argued that many hyperacuity tasks can be understood without resorting to special mechanisms. A previously developed contrast-detection model, based on spatial-frequency channels, has been applied directly to a set of hyperacuity experiments. Hyperacuity performance is readily predicted without modification of the model. In addition, the model correctly predicts the insensitivity of hyperacuity to suprathreshold contrast as well as the measured result that moderate low-pass filtering of hyperacuity images does not significantly decrease hyperacuity performance. Author

A86-11148
PERCEIVED CONTRAST IN THE FOVEA AND PERIPHERY
M. W. CANNON, JR. (USAF, Aviation Vision Laboratory, Wright-Patterson AFB, OH) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 2, Oct. 1985, p. 1760-1768. refs

Subjects estimated the perceived contrast of 2 deg diameter sine-wave grating patches for spatial frequencies of 2, 4, 8, and 16 cycles/deg, at eccentricities from 0 to 40 deg and contrasts up to 0.8. The data were well fitted in all cases by power functions of contrast minus threshold, with exponents of the order of 0.5 implying similar mechanisms in both fovea and periphery. The data also demonstrate that, at high physical contrast, the visual system is generally driven toward an operating state in which two stimuli of equal physical contrast have equal perceived contrast even if the thresholds are quite different. As a consequence, peripheral perceived contrasts produced by high physical contrasts show almost no change with eccentricity, whereas thresholds increase by at least an order of magnitude. This implies that mechanisms mediating threshold detection and suprathreshold perception may be different. Author

A86-12061
SPATIAL LOCATION AND HYPERACUITY - THE CENTRE/SURROUND LOCALIZATION CONTRIBUTION FUNCTION HAS TWO SUBSTRATES
D. R. BADCOCK and G. WESTHEIMER (California, University, Berkeley) Vision Research (ISSN 0042-6989), vol. 25, no. 9, 1985, p. 1259-1267. refs
(Contract PHS-EY-00220)

Contribution of the distribution of light to the spatial location of a feature was studied by investigating vernier acuity and jump detection in a perturbation technique, in which flanking lines are placed to the sides of the target line. It was found that the size and direction of vernier displacement, or jump, required for no apparent change of location, is influenced by the flanking line-test line distance (FTD) as well as by the contrast polarity of the flank (F). The effects of F polarity are different in the central FTD zone (i.e., on both sides between the two Fs) from those in the surround. Varying the duration of the F produces maximal effects in the surround with shorter duration than that required for maximal effects in the center. It is concluded that the localization contribution function has two components reflecting different mechanisms: in the center, the earlier (Westheimer and McKee, 1977) centroid hypothesis can be applied, while the surround has characteristics of the feature interaction seen in aftereffects. I.S.

A86-12431#
MEDICAL EVALUATION OF COSMONAUTS - PSYCHOLOGICAL TESTING
N. RAMACHANDRAN (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 133-139. refs

Psychological evaluation of the cosmonauts was done at two levels: One was personality evaluation and secondly assessment of their performance on a vigilance task. Both projective and objective tests were used. Twelve pilots were thus evaluated. Stress tolerance of all the subjects was found to be adequate. On the vigilance task the accuracy of spotting the correct signal ranged from 69 percent to 94 percent with an average of 87 percent. No rank rating of the subjects was made, the only criterion was psychological fitness, and none of the subjects was found to be psychologically unfit. Author

N86-10745# Joint Publications Research Service, Arlington, Va.
EFFECT OF EMOTIONAL STRESS ON HEMOSTASIS SYSTEM OF HEALTHY PERSONS Abstract Only
Y. I. SOKOLOV, T. P. KHOVANSKAYA, I. V. NOVIKOV, and M. V. BALUDA *In its* USSR Rept.: Life Sci. Biomed. and Behavioral Sci. (JPRS-UBB-85-023) p 62 18 Sep. 1985 Transl. into ENGLISH from Fiziol. Cheloveka (Moscow), v. 11, no. 1, Jan. - Feb. 1985 p 79-82
Avail: NTIS HC A06

The effect of emotional stress on activity of the sympatho-adrenal system and of some indicators of the system of thrombocytic-vascular and plasma links of hemostasis was studied. Emotional stress of the subjects caused increase of catecholamines in the blood and increases of excretion of them in the urine and activation of the anticoagulation system and increase of the blood heparin level while the fibrinolytic activity increased and the fibrogen concentration in the blood decreased. Thromboelastograms recorded in the first phase of coagulation showed a tendency toward hypocoagulation in the subjects, under emotional stress. Emotional stress shows a tendency toward the increase of heparin tolerance of the plasma but does not change the ADP-induced aggregation of thrombocytes. E.A.K.

N86-10775 Institute for Perception RVO-TNO, Soesterberg (Netherlands).
STUDIES ON HUMAN VEHICLE CONTROL
H. GODTHELP 1984 159 p refs
(B8563352) Avail: Issuing Activity

The accuracy of closed and open loop steering were measured in a reproduction task. Precognitive control aspects of open and closed loop steering in a lane change maneuver were studied. Preview control in open and closed loop steering on entering a bend was investigated. Straight lane keeping compensatory control and the limits of error neglecting in lane keeping were examined. For closed loop conditions, amplitude accuracy is linearly dependent on movement velocity, illustrating the validity of Fitts' law for continuous, closed loop movements. However, for open loop conditions the results indicate the amplitude accuracy to depend only on movement amplitude and not on velocity. Driver's self-chosen occlusion times correspond closely with time of lane crossing. Author (ESA)

N86-10776 Institute for Perception RVO-TNO, Soesterberg (Netherlands).
CAR DRIVING AS A SUPERVISORY CONTROL TASK
G. J. BLAAUW 1984 139 p refs
(B8563351) Avail: Issuing Activity

Car driving was analyzed using a supervisory driver model. The driver is assumed to supervise single tasks like lateral and longitudinal vehicle control, each of which is assumed to be autonomously controlled. The driver only intervenes when the conditions of a single task force him to. An integral description of multitask performance in driving is possible. An observation/prediction block, a control block and a decision-making block are distinguished. Results suggest that lateral control does not need continuous foveal visual information. In conditions creating

a minimum level of attention for lateral control, skilled and unskilled drivers show an acceptable stay within their lane, although variations in lateral control are larger than in other conditions. Performance during occlusion is not much affected in relation to multitask or deteriorated driving conditions. However, skilled drivers choose longer occlusion times than the unskilled drivers for comparable levels of driving performance. Author (ESA)

N86-10777*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE SYNTHESIS AND ANALYSIS OF COLOR IMAGES
B. A. WANDELL Sep. 1985 37 p refs
(NASA-TM-86844; REPT-85419; NAS 1.15:86844) Avail: NTIS HC A03/MF A01 CSCL 05I

A method is described for performing the synthesis and analysis of digital color images. The method is based on two principles. First, image data are represented with respect to the separate physical factors, surface reflectance and the spectral power distribution of the ambient light, that give rise to the perceived color of an object. Second, the encoding is made efficient by using a basis expansion for the surface spectral reflectance and spectral power distribution of the ambient light that takes advantage of the high degree of correlation across the visible wavelengths normally found in such functions. Within this framework, the same basic methods can be used to synthesize image data for color display monitors and printed materials, and to analyze image data into estimates of the spectral power distribution and surface spectral reflectances. The method can be applied to a variety of tasks. Examples of applications include the color balancing of color images, and the identification of material surface spectral reflectance when the lighting cannot be completely controlled.
Author

N86-10778# Department of the Air Force, Washington, D.C.
VISION TEST CHART AND METHOD USING GAUSSIANS Patent Application
H. L. TASK, inventor (to Air Force) 23 Jan. 1985 19 p
(AD-D011756; US-PATENT-APPL-SN-693927) Avail: NTIS HC A02/MF A01 CSCL 06L

A novel vision test device and method for measuring the ability of a subject to perceive contrasts is described, which comprises a chart for display to the subject having a plurality of visual test shapes systematically organized thereover in a predetermined array on a background of preselected luminance or reflectance level, each test shape having a preselected luminance level providing maximum contrast relative to background at its center and substantially zero contrast relative to background at its edges, the luminance (or reflectance) level of each test shape varying radially from its preselected distribution factor. GRA

N86-10779# Office of Naval Research, Arlington, Va. Psychological Sciences Div.
PSYCHOLOGICAL SCIENCES DIVISION 1984 PROGRAMS Annual Report, 1 Jan. - 1 Dec. 1984
M. A. TOLCOTT 1 Dec. 1984 184 p
(AD-A156631; REPT-442-4) Avail: NTIS HC A09/MF A01 CSCL 05J

This booklet describes research carried out under the Psychological Sciences Division of ONR during Fiscal Year 1984. The booklet is divided into three programmatic research area: Engineering Psychology; Personnel and Training; and Organizational Effectiveness - the last area will be re-named Group Psychology in Fiscal Year 1985. Specific study areas are: Man-Machine System Interfaces, Perception, Decision Making, Distributed Tactical Decision Making, Special Projects. Man-Machine Systems Technology, Defense Small Business Advanced Technology Program, Effective Heterogeneous Groups, personnel Turnover and Retention, Productivity in Organizations, Manpower R&D Programs, Theory-Based Personnel Assessment, Information-Processing Abilities, Attention and Action, Instructional Theory and Methods, Cognitive Processes. Each report within these sections gives specific objectives, approach, progress, potential applications. GRA

N86-10780# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Flugphysiologie und Psychologie.
EXTENDED ANALYSIS OF THE STRUCTURE OF ERROR SCORES IN PSYCHOLOGICAL APTITUDE TESTS
K. M. GOETERS Mar. 1985 50 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-943)
(DFVLR-FB-85-20; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16.50

A series of psychological aptitude tests was analyzed with respect to human performance and reliability. A factor analysis of the test scores reveals five components of performance. Three independent error components are extracted: errors in quick visual detection of targets; difficulties in mental processing of numbers and symbols; and erroneous actions under performance stress. All three factors are the expression of a deficient control of performance. They are discussed as functional aspects of decision making and human information processing. Author (ESA)

N86-10781# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abt. Flugphysiologie und Psychologie.
SPEED OF WORK AND ERROR RATE: ANALYSES OF INDIVIDUAL DIFFERENCES IN A CHOICE REACTION SERIES WITH A COGNITIVE COMPONENT
K. M. GOETERS Mar. 1985 27 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-944)
(DFVLR-FB-85-21; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 10.50

A visual choice reaction test with a cognitive component was introduced to measure response processes in more detail than is possible with summarizing scoring of paper pencil tests. For each reaction the following information was registered: stimulus (light), reaction (right/wrong), reaction time, and omission (yes/no). Each subject had to react on 320 successive signals without pause. From the reaction protocol of each subject indices for speed of work, oscillation of performance, error disposition, and reaction inhibition were computed. The main result is that in this reaction test speed of work and error disposition are not coupled. Errors are not a consequence of quick reactions. The observed errors seem to be the expression of an increased variation in performance. The results are discussed with a view to a psychophysiological model of activation. Author (ESA)

N86-10782# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Psychologie.
STANDARDIZATION OF TASKS: APPROACH PLANNING
A. W. K. GAILLARD and L. C. BOER Jul. 1984 19 p In DUTCH; ENGLISH summary
(Contract A83/K/045)
(IZF-1984-19; TDCK-79518) Avail: NTIS HC A02/MF A01

Ten information processing tasks were grouped on a micro-computer for use in, e.g., personnel selection, the registration of pyschological fitness (combat readiness) and assessing mental workload. Testing areas are: reaction time, (continuing) memory searching, selective attention, pursuit-tracking, serial memory, word classification, logical arguing, and response-conflict situations. The program is developped to be administered by personnel with 1 week training. Author (ESA)

N86-10783# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.
PATH ERROR-NEGLECTION IN STRAIGHT LANE DRIVING
J. GODTHELP Oct. 1984 21 p refs
(IZF-1984-32; TDCK-79698) Avail: NTIS HC A02/MF A01

Decision rules, describing how drivers switch from error-neglection to error-correction when approaching the edge of a lane, were derived for a straight lane keeping task. Drivers were instructed to neglect the vehicle path error and to switch over to error-correction only at that moment. The vehicle motion still could comfortably be corrected to prevent a crossing of the

lane boundary. The results show that the lateral distance from the lance boundary at which drivers switch to error-correction increases linearly with the lateral approach speed. This mechanism results in a constant time to lane crossing distance at this decision moment, this result being consistant for a broad range of speeds. Author (ESA)

N86-11850*# Old Dominion Univ., Norfolk, Va. Dept. of Psychology.
VISUAL INFORMATION TRANSFER. PART 1: ASSESSMENT OF SPECIFIC INFORMATION NEEDS. PART 2: PARAMETERS OF APPROPRIATE INSTRUMENT SCANNING BEHAVIOR Progress Report, 15 Feb. - 15 Oct. 1985
J. R. COMSTOCK, JR., R. H. KIRBY, and G. D. COATES Oct. 1985 11 p refs
(Contract NAG1-451)
(NASA-CR-176277; NAS 1.26:176277) Avail: NTIS HC A02/MF A01

The present study explored eye scan behavior as a function of level of subject training. Oculometric (eye scan) measures were recorded from each of ten subjects during training trials on a CRT based flight simulation task. The task developed for the study incorporated subtasks representative of specific activities performed by pilots, but which could be performed at asymptotic levels within relatively short periods of training. Changes in eye scan behavior were examined as initially untrained subjects developed skill in the task. Eye scan predictors of performance on the task were found. Examination of eye scan in proximity to selected task events revealed differences in the distribution of looks at the instruments as a function of level of training. Author

N86-11851# Pennsylvania State Univ., University Park. Dept. of Psychology.
ADAPTIVE MOTIVATION THEORY Final Report
F. J. LANDY and W. S. BECKER Jun. 1985 69 p
(Contract N00014-81-K-0197)
(AD-A157440; REPT-85-1) Avail: NTIS HC A04/MF A01
CSCL 05J

Traditional approaches to understanding motivation have not been successful. Middle range theories are necessary for progress in this area. Cognitive processes will play a major role in motivation theories of the future. Various middle range theories are likely to be more suitable for understanding some dependent variables than others. The work on adaptive motivation theory was intended to be preliminary, exploring the possible advantages of a reconceptualization of motivation theory. In this report, we see our goal as introducing some lines of speculation, sampling some recent research that gives rise to that speculation, and presenting specimens of new theory and research designs and, ultimately, persuading the reader to pick up the burden of a novel idea or approach and to carry it some distance for us. Various technical and quarterly reports have detailed the development of questionnaires and methods of measuring components of adaptive motivation theory. In this report, we identify the nature and extent of that conceptual work. In effect, we suggest that it may be valuable to explore more deeply the cognitive roots of many of the current approaches. Through such an exploration, it may be possible to develop a set of middle range theories capable, in aggregate, of explaining motivated behavior. GRA

N86-11852# Oregon Univ., Eugene. Dept. of Psychology.
COGNITIVE SCIENCE PROGRAM: DISSOCIATION OF THE CENTRAL TIMEKEEPER AND THE PERIPHERAL IMPLEMENTATION PROCESSES IN REPETITIVE MOVEMENTS Final Technical Report
R. B. IVRY and S. W. KEELE 15 May 1985 23 p
(Contract N00014-83-K-0601)
(AD-A157542; TR-85-7-ONR) Avail: NTIS HC A02/MF A01
CSCL 06E

Wing and Kristofferson (1973) have proposed a two-stage model of timing in repetitive motor behavior which assumes independence of a central timekeeper process and the peripheral implementation system. This model was tested with a patient who has incurred a peripheral motor neuropathy. The patient's inconsistent performance in a periodic tapping task with the afflicted hand was found to be attributable to increased variability in the motor implementation process only. This report, in conjunction with the previous study of Wing et al., (1984) in which a Parkinsonian patient was found to have a timekeeper deficit, provides a double dissociation of the timekeeper and implementation processes. Thus, the independence assumption of the Wing and Kristofferson model is supported. GRA

N86-11853# Lawrence Livermore National Lab., Calif.
PSYCHOLOGICAL ASPECTS OF PERSONNEL CONTAMINATION
R. L. WILSON Apr. 1985 7 p refs Presented at the Hazardous Mater. Conf., Oakland, Calif., 23 Apr. 1985
(Contract W-7405-ENG-48)
(DE85-012955; UCRL-92501; CONF-8504140-1) Avail: NTIS HC A02/MF A01

This paper discusses some of the major emotional considerations involved in the treatment of people who have been contaminated with potentially hazardous materials. Although the principal focus is the treatment of people trained to work with these materials, an attempt is also made to extend these methods to people having little or no knowledge of such matters. Accidents always result in emotional trauma. When the accident involves radioactive or other potentially toxic, carcinogenic, or mutagenic materials, there is a possibility of enhanced emotional stress due to the mystique surrounding these substances. Several psychological principles that have emerged from the treatment of radioactively contaminated workers are: (1) provide preaccident training for all radiation workers; (2) avoid secrets; (3) as rapidly as possible following a contamination accident, bring the worker into contact with others; (4) recognize the emotions of the family and the family's fears and trauma; and (5) do not desert the worker after decontamination has been completed. DOE

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-10102
NONINVASIVE DOPPLER DETERMINATION OF CARDIAC OUTPUT DURING SUBMAXIMAL AND PEAK EXERCISE
J. G. SHAW, E. C. JOHNSON, W. F. VOYLES, and E. R. GREENE (Lovelace Medical Foundation; New Mexico, University, Albuquerque, NM) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Sept. 1985, p. 722-731. refs

Stroke volume (SV) and cardiac output (CO) were measured as a function of work load by a pulsed Doppler (PD) technique, obtaining the Doppler-shifted frequency from the ascending aorta of 10 sitting subjects who were exercized on an ergometer to exertion. The PD-generated CO and CV values in 207 determinations were assessed for technical reproducibility of the PD method, and compared with the literature values obtained by standard invasive methods. Technical reproducibility was estimated by comparing with paired t test the differences between 65 duplicate serial measurements of CO and CV. No significant differences (P less than 0.001) were found. Absolute values of CO and CV understimated the literature values across all work loads by 15 to 21 percent. Possible factors for these differences are discussed. I.S.

A86-10158
HIERARCHY OF CONTROL MODELS FOR TEMPERATURE REGULATION
J. WERNER (Bochum, Ruhr-Universitaet, West Germany) International Journal of Modelling and Simulation (ISSN 0228-6203), vol. 5, no. 2, 1985, p. 58-63. refs
(Contract DFG-SFB-114)

Five different mathematical models for the control loop regulating human body temperature are reviewed, along with possible applications. A one-loop model for passive control has exhibited promise for understanding steady-state thermoregulation and the fever process. Core-shell models describe heat flow and are particularly well-suited to studying the effects of workload on thermoregulation. Multi-element (layer) models treat the body as a collection of cylinders arranged in concentric layers, each coupled by circulation, and allowing depiction of the dynamics of thermoregulation. Multi-element (circle) models portray body segments as cylinders coupled by a one-loop circulatory system, permitting examination of the radial dependencies of temperature within the body. Finally, three-dimensional models are applied in analyses of the distributed parameter control system, and are an approach to the nonlinear properties of the biological control loop. Effective use of the models requires access to fast, large capacity computers. M.S.K.

A86-10263
THERMAL INSULATING CAPABILITIES OF 'THIN' CLOTHING INSULATION
W. C. KAUFMAN and D. J. BOTHE (Wisconsin, University, Green Bay) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Oct. 1985, p. 1011-1013. Research supported by the Eddie Bauer Co. and Gillette Industries. refs

Swatches and sleeping bags composed of polyolefin, down and polyester were placed over a heat source to test the thermal insulating properties of the materials. Thermistors on each side of the cloth furnished temperature data. The data were analyzed by an equation which took into account the presence of an air layer, which is classically thought to enhance the insulating properties. The polyolefin fibers did not exhibit superior insulating properties beyond those available from any thin fabric. The air layer/down loft was the principal agent of increased insulation. M.S.K.

A86-12379
HEMODYNAMIC EFFECTS OF ANTI-G SUIT INFLATION IN A 1-G ENVIRONMENT
J. F. SEAWORTH, T. J. JENNINGS, L. L. HOWELL, J. W. FRAZIER, C. D. GOODYEAR (USAF, Aerospace Medical Research Laboratory and Medical Center, Wright-Patterson AFB, OH) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Oct. 1985, p. 1145-1151. refs

The effect of anti-G suit inflation on cardiac volumes, cardiac output, and peripheral vascular resistance was assessed. Two-dimensional echocardiography was used to measure end-diastolic and end-systolic volumes at rest and after inflation of the anti-G suit with pressures of 2, 4, and 6 psi in 10 male subjects in both standing and supine positions. In the supine position, mean arterial pressure increased from base-line for all three inflation pressures. The end-diastolic volume increased after 2-psi inflation. Cardiac output or stroke volume did not change. After standing, mean arterial pressure, end-diastolic volume, and stroke volume fell after suit deflation. Peripheral vascular resistance fell in the 2and 4-psi inflation profiles. In the standing protocol, mean arterial pressure, end-diastolic volume, stroke volume, and cardiac output rose with all three inflation pressures. After reclining, heart rate increased and mean arterial pressure fell in the 4- and 6-psi inflation profiles after suit deflation. C.D.

A86-12436#
VIBRATION TRANSMISSIBILITY IN SEATED SUBJECTS
M. K. VYAWAHARE and D. T. SHAKUNTHALA (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation Medicine, vol. 28, Dec. 1984, p. 162-170. refs

Vibration transmissibility at shoulder and thigh levels in upright seated individuals with respect to seat vibration is determined. The electrohydraulic vibrator, seat, cockpit, piezoelectric accelerometer, and vibration meter used in the experiment are described. The procedures for testing shoulder and thigh vibration transmissibility in subjects seated directly on a seat, on a compressible cushion, on a fiber glass pad, and on a fiber glass pad plus a fiber glass back rest are explained. The vibration transmission was measured and the results for the mean value of thigh and shoulder level vibration transmissibility and maximum thigh and shoulder level vibration transmissibility versus body weight are tabularly presented. The data is explained and it is concluded that vibration intensity at thigh and shoulder levels of a seated upright subject is less than at the seat level. I.F.

N86-10784 Ohio State Univ., Columbus.
THE INFLUENCE OF TACTUAL SEAT-MOTION CUES ON TRAINING AND PERFORMANCE IN A ROLL-AXIS COMPENSATORY TRACKING TASK SETTING Ph.D. Thesis
E. A. MARTIN 1985 327 p
Avail: Univ. Microfilms Order No. DA8510600

A considerable body of knowledge exists regarding the influence of whole-body motion on the control behavior and task performance of a vehicle operator required to compensate for the effects of unexpected external disturbances. The research described was conducted to determine whether similar effects would be observed if the motion information were tactually displayed through the seat pan, rather than in a whole-body motion environment. The experiment was designed such that the transfer of training from a tactual dynamic seat display to a whole-body motion environment could also be evaluated. The environmental task required subjects to regulate for a random-appearing, roll-axis disturbance in a simulated vehicle having aircraft-like dynamics. A centrally located compensatory display, subtending about nine degrees, provided visual roll error information. Control inputs were made via a right side-arm isometric controller. The two-phase experiment included a training phase and a criterion phase. The data clearly demonstrate that a dynamic sea pan can effectively impart motion information. Dissert. Abstr.

N86-10785*# Pennsylvania Univ., Philadelphia. Dept. of Computer and Information Science.
TEMPUS: SIMULATING PERSONNEL AND TASKS IN A 3-D ENVIRONMENT Final Report
N. I. BADLER and J. D. KOREIN 31 May 1985 18 p
(Contract NAS9-16634)
(NASA-CR-171901; NAS 1.26:171901) Avail: NTIS HC A02/MF A01 CSCL 05H

The latest TEMPUS installation occurred in March, 1985. Another update is slated for early June, 1985. An updated User's Manual is in preparation and will be delivered approximately mid-June, 1985. NASA JSC has full source code listings and internal documentation for installed software. NASA JSC staff has received instruction in the use of TEMPUS. Telephone consultations have augmented on-site instruction. G.L.C.

N86-10786# Defence Research Establishment, Ottawa. (Ontario).
EFFECT OF INCREASED BODY CLOTHING INSULATION ON HAND TEMPERATURE IN A COLD ENVIRONMENT
S. D. LIVINGSTONE, R. W. NOLAN, and S. W. CATTROLL Dec. 1984 17 p
(AD-A156597; DREO-TN-84-26) Avail: NTIS HC A02/MF A01 CSCL 06Q

Thermal protection of personnel who must remain relatively inactive while performing tasks outdoors in the cold is a continuing problem. Provision of comfort and allowing for mobility are design difficulties experienced by persons working in the cold at tasks

for which manual dexterity is required is In such situations only very light handwear can be worn and often, mitts or gloves must be removed in order to perform the task. A particular example of such a task exists at the CF Satellite Tracking and Identification Unit at St. Margaret's, New Brunswick. The telescope which is used for tracking satellites is located outdoors when operational. To minimize optical interference, the area around the telescope cannot be heated in winter. During the course of the tracking sequence, which takes about 30 minutes, the operator must be in contact with the large metal mass of the telescope. In addition, the operation of the steering control button requires that if any handwear is worn, it must be very thin. Operating temperatures as low as -20 C are often experienced. It was found that, as predicted, if additional insulation was applied to the whole body of the man, the temperature of his hands could be maintained for a longer period of time. GRA

N86-10787# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MILD HYPOXIA AND VISUAL PERFORMANCE WITH NIGHT VISION GOGGLES M.S. Thesis
L. L. LEBER May 1985 57 p
(AD-A156969; AD-E950724; AFIT/CI/NR-85-35T) Avail: NTIS HC A04/MF A01 CSCL 06E

Pilots have frequently reported an apparent darkening of the visual field while flying at high altitude without supplemental oxygen, and subsequent exposure to oxygen resulted in marked increases in the brightness of lights. Likewise, at low light intensities visual acuity is greatly decreased during oxygen deprivation. In contrast, at high light intensities, the effect of moderate oxygen deprivation on visual acuity is slight. Even though the Night Vision Goggles (NVGs) amplify low night illumination, the interaction between amplified illumination and high altitude effects may provide to be important factors in visual performance. The objective of this research was to investigate the effects of mild hypoxid aon monocular visual performance with NVGs. This study revealed that mild oxygen deprivation significantly affects unaicied square-0wave grating visual acuity but does not significantly affect NVG-augmented performance. Large differences between visual sensitivities at different spatial frequencies were not differentially affected by mild hypoxia. Supplemental oxygen did significantly improve naked-eye but not NVG-augmented night resolution acuity up to an altitude of 13,000 feet (3,692 m) above sea level (ASL). GRA

N86-10788# Aeronautical Research Labs., Melbourne (Australia).
A GRAPHIC ANTHROPOMETRIC AID FOR SEATING AND WORKPLACE DESIGN
K. C. HENDY, K. W. ANDERSON, and D. M. DRUMM Apr. 1984 60 p
(AD-A156988; AD-E950724; ARL/SYS-R-29) Avail: NTIS HC A04/MF A01 CSCL 06N

In recent workplace design projects at ARL, a procedure for the use of anthropometric information has be developed which relies on the use of sets of anthropometric data from individuals rather than the conventionally used pooled data. This report describes a graphic anthropometric design aid which has been devised to assist in the implementation of this procedure. The aid predicts the positions, in side elevation, of certain cardinal points which are considered to be important to the design process, viz, the eye, thumb tip reach, knee point, seat reference point and heel point. This report also contains details of the design aid's validation, the concept of the aid's use and the fidelity of the aid within the design process. GRA

N86-10789# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Thermofysiologie.
THE WEARING COMFORT OF THE PVC: COMBAT BACK PACK
F. J. G. VANDERLINDE and H. VANMIDDENDORP Nov. 1984 24 p In DUTCH; ENGLISH summary
(Contract A79/KL/097)
(IZF-1984-34; TDCK-79782) Avail: NTIS HC A02/MF A01

A PVC coated back pack was compared to canvas ones. Wearing comfort, particularly with regard to sweat build-up, body temperatures, and thermal sensation were studied. Data from two subjects walking on a treadmill in a climate chamber were obtained. The PVC prototype scores slighthy better the canvas rucksack. Author (ESA)

N86-11854*# Martin Marietta Aerospace, Denver, Colo.
TELEOPERATOR HUMAN FACTORS STUDY Progress Report, 7 Sep. - 6 Oct. 1985
K. Z. BRADFORD and R. T. SCHAPPELL Oct. 1985 6 p
(Contract NAS8-35184)
(NASA-CR-176310; NAS 1.26:176310; MCR-83-607) Avail: NTIS HC A02/MF A01 CSCL 05H

The progress made on the Teleoperator Human Factors Study program during the period of September 7, 1985 to October 6, 1985 is discussed. Technical and programmatic problems that were encountered are discussed along with activity planned for the following month. The main portion of the report has been separated into four sections: Work Performed, Future Work, Problems Encountered, and Cost Information. G.L.C.

N86-11855# Oak Ridge National Lab., Tenn.
MECHANICAL ACCESSORIES FOR MOBILE TELEOPERATORS
M. J. FELDMAN and J. N. HERNDON 1985 19 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiol. Emergency Response and Recovery, Dallas, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014310; CONF-8506148-2) Avail: NTIS HC A02/MF A01

The choice of optimum mechanical accessories for mobile teleoperators involves matching the criteria for emergency response with the available technology. A general background is presented to teleoperations, a potpourri of the manipulator systems available, and an argument for force reflecting manipulation. The theme presented is that the accomplishment of humanlike endeavors in hostile environments will be most successful when man model capabilities are utilized. The application of recent electronic technology to manipulator development has made new tools available to be applied to emergency response activities. The development activities described are products of the Consolidated Fuel Reprocessing Program at the Oak Ridge National Laboratory. DOE

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-12003
RADIATION CHEMISTRY OF AN AQUEOUS SOLUTION OF GLYCINE COMPOUNDS OF INTEREST TO CHEMICAL EVOLUTION STUDIES
Z. D. DRAGANIC, S. I. VUJOSEVIC (Universidad Nacional Autonoma de Mexico, Mexico City), and V. NIKETIC (Beograd, Univerzitet, Belgrade, Yugoslavia) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 82-90. Research supported by the Serbian Research Fund. refs

An examination has been conducted of the radiolysis of an O2-free aqueous solution of glycine at absorbed doses of Co-60 gamma-radiation of up to 20 Mrad. At least 20 compounds are formed during radiolysis, among them several amino acids, an

oligoamine, and the nitrogen-free polymers (Mw equal to or less than 28,000 daltons). When dicyandiamide is present in the solution of glycine, various nitrogen-containing products, including some polymers (Mw equal to or less than 12,000 daltons), are synthesized along with radiolytic products of glycine; polyglycines are not formed. The radiation-chemical yields of radiolytic-product formation and of decomposition of glycine have been determined and possible free-radical reactions leading to the radiation-induced changes observed have been considered. Author

A86-12004
COULD LIFE HAVE ARISEN IN THE PRIMITIVE ATMOSPHERE?
S. SCHERER (Konstanz, Universitaet, Constance, West Germany) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 91-94. refs

A model developed in connection with a modification and extension of concepts proposed by Oparin (1924) provides currently the basis for almost all attempts to explain the origin of life. However, in spite of the common acceptance of the Oparin model, Woese (1979, 1980) has rejected the Oparin thesis and proposed a completely new hypothesis on the origin of life. The present communication provides a fundamental critique of the alternative model suggested by Woese, Woese had assumed that the progenitors of life originated in the atmosphere. A number of arguments against the new model are discussed. These arguments are related to the presence of free oxygen and ultraviolet radiation, convection cycles, the suspension time of droplets, and the consideration of chemical limits. G.R.

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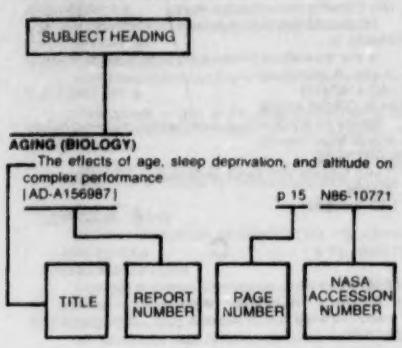

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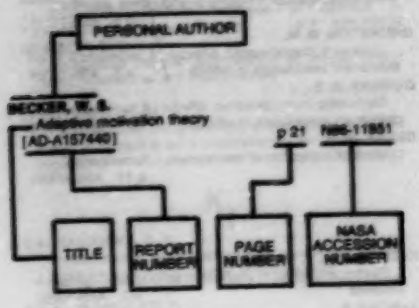

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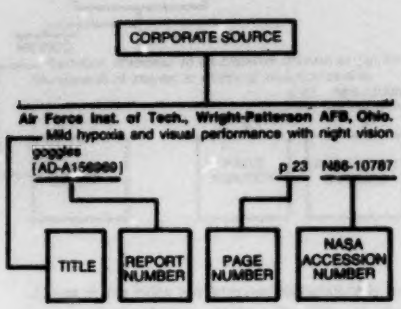

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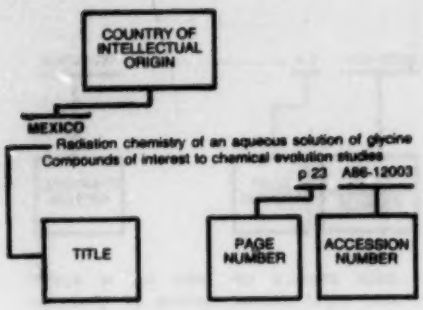

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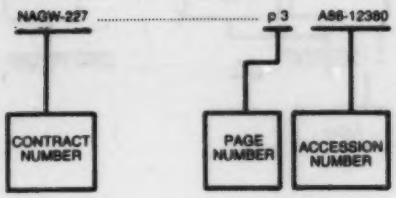

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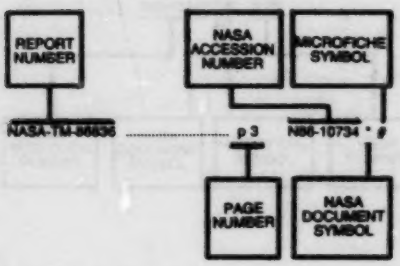

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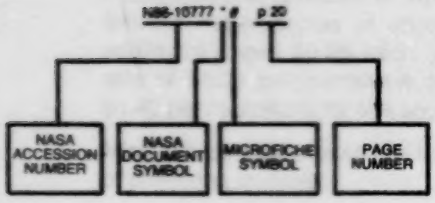

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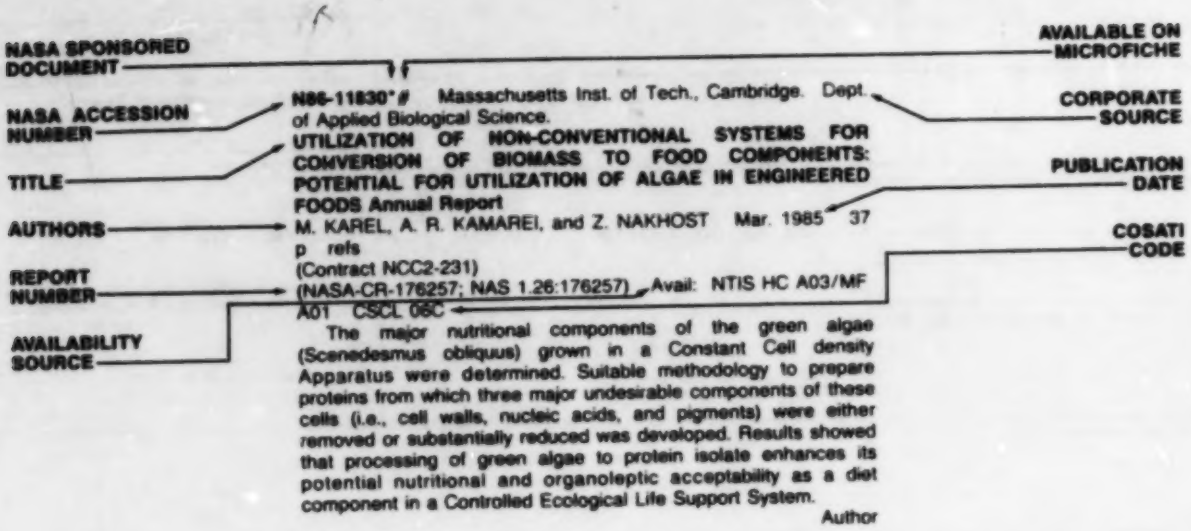

N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.

UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report

M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs

(Contract NCC2-231)

(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.

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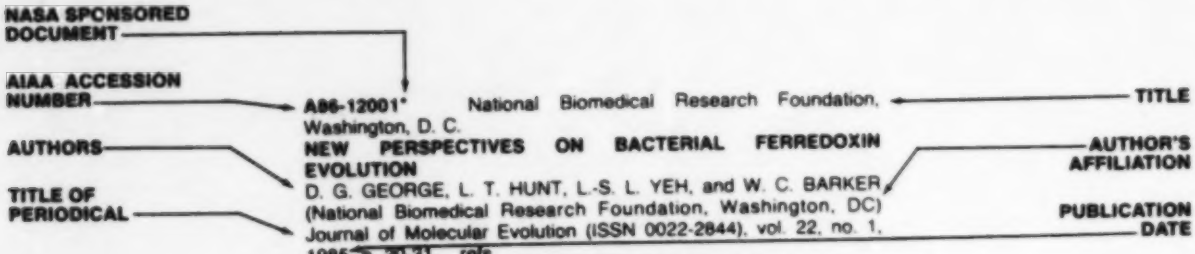

A86-12001* National Biomedical Research Foundation, Washington, D. C.

NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION

D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)

Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs

(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)

Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.

G.R.

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NASA SP-7011(282)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 282)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in February 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1986
National Aeronautics and Space Administration
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This supplement is available as NTISUB/123/093 from the National Technical Information Service (NTIS), Springfield, Virginia 22161 at the price of $8.00 domestic; $16.00 foreign.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 154 reports, articles and other documents announced during February 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 282)

MARCH 1986

51

LIFE SCIENCES (GENERAL)

Includes genetics.

A86-13457
A HANDBOOK OF RADIATION DOSIMETRY AND HYGIENE [SPRAVOCHNIK PO DOZIMETRII I RADIATSIONNOI GIGIENE]
A. A. MOISEEV and V. I. IVANOV Moscow, Energoatomizdat, 1984, 296 p. In Russian. refs

Statistical techniques for estimating the effects of ionizing radiation on human populations are described. Consideration is given to both natural and anthropogenic sources of radioactivity, including: the cosmic ray background radioactive isotopes; radiological examinations; and fallout. Specific dose effects are estimated for the different organic structures in the body including brain and liver cells; bone marrow; the endocrine system; and the liver. The statistical distribution of radiation hazards in different regions of the earth and in different occupations is described in detail. I.H.

A86-13460
THE ENVIRONMENT AND THE HEART [VNESHNAIA SREDA I SERDTSE]
A. K. KADYRALIEV and A. IU. TILIS Frunze, Izdatel'stvo Kyrgyzstan, 1984, 112 p. In Russian.

The effect of high-altitude (HA) hypoxia on pathophysiological changes in the cardiovascular system (CVS), and the mechanisms of CVS adaptation to HA in animals with experimental mitral valve defect (MVD) were studied. The MVD was initiated by reception of 13-18 pct valve area in dogs either at 760 m above sea level or at 3200 m (adapted or nonadapted animals), and various functional parameters, such as the heart rate, intracardiac and central blood pressure (BP), blood volumes, were measured before, during and in the periods following 60-day adaptation to HA, as well as upon return to 760 m. In addition, microstructural changes in the myocardium were studied by means of electron microscopy. Exposure to HA of dogs with MVD led to a high degree of lethal decompensation. The increase of BP during hyperfunction caused the destruction of intracellular membranes and vacuolation of mitochondria in the cardiomyocytes. Administration of strophanthin decreased the effects of HA hypoxia and lethality in all groups of dogs with MVD. I.S.

A86-13648
EXTREMELY THERMOPHILIC BACTERIA LIVING AT TEMPERATURES ABOVE 100 C [EKSTREMAL'NO-TERMOFIL'NYE BAKTERII, ZHIVUSHCHIE PRI TEMPERATURE VYSHE 100 DEG]
L. G. LOGINOVA (AN SSSR, Institut Mikrobiologii, Moscow, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Sept.-Oct. 1985, p. 700-714. In Russian. refs

Characteristics of extremely thermophilic bacteria grown under laboratory conditions of high temperature and high pressure (necessary to suppress boiling) are presented. All such bacteria belong to the group of Archaebacteria and are anaerobes, living in nature in hot springs or near the undersea volcanoes at elevated pressure at which the solubility of oxygen is very low. Many species of thermophilic bacteria isolated by Zillig and Stetter, et al. (e.g., 1983) from hot springs of volcanic origin in Iceland are described in detail including their micrographs. The potential use of extremely thermophilic bacteria in metallurgy (e.g., for leaching out metals and desulfurization of carbon), the chemical industry (e.g., in the production of ethanol from cellulose, and methane from carbon dioxide), as well as in other fields and in research, are discussed. I.S.

A86-14117
HABITABILITY OF THE EARLY EARTH - CLUES FROM THE PHYSIOLOGY OF NITROGEN FIXATION AND PHOTOSYNTHESIS
K. M. TOWE (Smithsonian Institution, Dept. of Paleobiology, Washington, DC) Origins of Life (ISSN 0302-1688), vol. 15, no. 4, 1985, p. 235-250. refs

The study of nitrogen fixation and photosynthesis in order to determine the habitability of the Archean environment is discussed. The effects of ammonia and oxygen on the nitrogenase enzymes used in nitrogen fixation are described. An ammonia concentration of greater than 0.0001 M inhibited enzyme activity and an oxygen concentration above 16-0.1 micron-M caused destruction of the enzymes in the Archean environment. With the development of oxygenic photosynthesis the process of nitrogen fixation was affected; three evolutionary approaches which explain how an organism could have survived are presented. The utilization of carbon dioxide and sulfides in the photosynthesis processes is studied. The effect of oxygen on photosynthesis is analyzed and the importance of superoxide dismutases and RuBP oxgenase is discussed. It is concluded that with a carbon concentration of 100 PAL, sulfides at 0.0004M, and oxygen greater than 21 percent photosynthesis was possible in the Archean environment. I.F.

A86-14119
CARBON ISOTOPE DISCREPANCY BETWEEN PRECAMBRIAN STROMATOLITES AND THEIR MODERN ANALOGS - INFERENCES FROM HYPERSALINE MICROBIAL MATS OF THE SINAI COAST
M. SCHIDLOWSKI (Max-Planck-Institut fuer Chemie, Mainz, West Germany) Origins of Life (ISSN 0302-1688), vol. 15, no. 4, 1985, p. 263-277. DFG-supported research. refs

An isotope survey of hypersaline cyanobacterial mats from the Sinai Peninsula is used to analyze the high delta C-13 values found in ancient stromatolites. The carbon fixation of benthic microbial communities via the C3 pathway and the fractionation of the ribulose biphosphate carboxylase reaction are described. Fractionations result from limitations of a diffusion-controlled assimilatory pathway in which the isotope effect of the enzymatic reaction is suppressed. The influence of the protective slim coatings and reduced CO2 solubilities on the transport of CO2 is discussed. It is proposed that increased ratios of CO2 in Precambrian atmosphere contributed to the elimination of the diffusion barrier in the carbon-fixing pathways, thereby resulting in the increased delta C-13 concentrations found in ancient mat-forming microbiota. I.F.

A86-14124* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE MICROBIAL COMMUNITY AT LAGUNA FIGUEROA, BAJA CALIFORNIA MEXICO - FROM MILES TO MICRONS
J. F. STOLZ (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; Boston University, MA) Origins of Life (ISSN 0302-1688), vol. 15, no. 4, 1985, p. 347-352. refs

The changes in the composition of the stratified microbial community in the sediments at Laguna Figeroa following floods are studied. The laguna which is located on the Pacific coast of the Baja California peninsula 200 km south of the Mexican-U.S. border is comprised of an evaporite flat and a salt marsh. Data collected from 1979-1983 using Landsat imagery, Skylab photographs, and light and transmission electron microscopy are presented. The flood conditions, which included 1-3 m of meteoric water covering the area and a remanent of 5-10 cm of siliciclastic and clay sediment, are described. The composition of the community prior to the flooding consisted of Microcoleus, Phormidium sp., a coccoid cynanobacteria, Phloroflexus, Ectothiorhodospira, Chloroflexus, Thiocapsa sp., and Chromatium. Following the floods Thiocapsa, Chromatium, Oscillatora sp., Spirulina sp., and Microcoleus are observed in the sediments.
I.F.

A86-14313* Maryland Univ., Baltimore.
EFFECTS OF SUSPENSION HYPOKINESIA/HYPODYNAMIA ON RAT SKELETAL MUSCLE
S. R. MAX (Maryland, University, Baltimore) and D. E. FLYNN Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1065-1069. Research supported by the University of Maryland. refs
(Contract NAG2-100)

The effects of suspension hypokinesia/hypodynamia (H/H) on properties of soleus and plantaris muscles of rats were studied. The objective was to compare the effects of this model to those of disuse atrophy. After 12 d of H/H, there were significant decreases in soleus and plantaris muscle wet weight and citrate synthase activity. Soleus muscle was affected to a greater extent than plantaris muscle. There was a significant decrease in noncollagen protein content of H/H soleus muscle. Triceps brachii muscles did not display significant changes in any parameters measured, suggesting that observed changes were not due to systemic factors. There was no significant change in the water content of H/H soleus or plantaris muscles. Suspension H/H causes muscle changes different from those secondary to limb immobilization, in which soleus and plantaris muscles are equally affected.
Author

A86-14314
EFFECTS OF HEAD AND BODY RESTRAINT ON EXPERIMENTAL MOTION-INDUCED SICKNESS IN SQUIRREL MONKEYS
C. R. WILPIZESKI, L. D. LOWRY, R. B. CONTRUCCI, S. J. GREEN, and W. S. GOLDMAN (Thomas Jefferson University, Philadelphia, PA) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1070-1073. Research supported by the Ben Franklin Partnership. refs

Each of 16 Bolivian-phenotype squirrel monkeys of mixed sex had a machine bolt mounted on the skull with acrylic cement; 13 were provided with temporary plaster body casts allowing free movement. With eyes open, all were rotated in the horizontal plane at 30 rpm every other day until vomiting occurred or for a maximum duration of 120 min/spin. Latencies for motion-sickness signs were recorded under three experimental conditions: (1) free movement, (2) torso fixed to an aluminum frame and (3) both torso and head restrained by bolting to the frame. Subsequently, 10 monkeys from this sample were rotated while blindfolded with head and torso immobilized. Results partially confirmed human and animal findings reported by others: reduced mobility was accompanied by a reduction in the incidence and an increase in the latency of motion sickness. The importance of optokinetic input for the generation of motion sickness in this species was clear.
Author

A86-14386#
MICROBIOLOGICAL MANAGEMENT OF SPACELAB 3 RODENTS
G. A. FUNK and W. E. HINDS (Management and Technical Services Co., Moffett Field, CA) IN: Shuttle Environment and Operations II Conference, Houston, TX, November 13-15, 1985, Technical Papers . New York, AIAA, 1985, p. 70-74.
(AIAA PAPER 85-6090)

The 24 laboratory rats recently flown aboard Spacelab 3 were subjected to a stringent microbiological management program designed to minimize the risk to crew of animal-borne disease. The rodents had to be shown free of several specific microorganisms to be acceptable for flight. Efforts to acquire such rodents began with vendor testing one year before flight. No animals were shipped to Kennedy Space Center without immediate prior demonstration of the microbiogical acceptability of their source colony. All flight rodents were recertified to be in concurrence with flight requirements eight days before launch, and were tested upon landing to confirm their continued flight acceptability.
Author

A86-14593
PROTEINS AND RNA IN THE NEURON-NEUROGLIA SYSTEM OF N. RAPHE DORSALIS NEURONS OF THE GROUND SQUIRREL BRAIN DURING HIBERNATION [BELKI I RNK V SISTEME NEIRON-NEIROGLIIA N. RAPHE DORSALIS GOLOVNOGO MOZGA SUSLIKA V DINAMIKE ZIMNEI SPIACHKI]
T. N. GOLOVINA, U. M. MALIKOV, T. KH. SHORTANOVA, and N. N. DEMIN (Kabardino-Balkarskii Gosudarstvennyi Universitet, Nalchik; AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Aug. 1985, p. 945-950. In Russian. refs

A86-14594
HEAT SENSITIVITY OF THE MEDIAL PREOPTIC REGION OF THE HYPOTHALAMUS DURING SEASONAL ADAPTATION AND ACCLIMATIZATION TO HIGH AMBIENT TEMPERATURE [TEPLOVAIA CHUVSTVITEL'NOST' MEDIAL'NOI PREOPTICHESKOI OBLASTI GIPOTALAMUSA PRI SEZONNOI ADAPTATSII I AKKLIMATSII K VYSOKOI VNESHNEI TEMPERATURE]
M. D. KHUDAIBERDIEV (AN TSSR, Institut Fiziologii i Eksperimental'noi Patologii Aridnoi Zony, Ashkhabad, Turkmen SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Aug. 1985, p. 952-957. In Russian. refs

A86-14595
NECK AND OCULOMOTOR REFLEXES INDUCED BY ELECTRICAL STIMULATION OF THE SEMICIRCULAR CANAL AMPULLAE IN THE PIGEON [SHEINYE I GLAZODVIGATEL'NYE REFLEKSY, VYZVANNYE ELEKTRICHESKOI STIMULIATSIEI POLUKRUZHNYKH KANALOV U GOLUBIA]
I. V. ORLOV (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Aug. 1985, p. 977-984. In Russian. refs

The ampullae of horizontal, anterior, and posterior canals of the alert pigeon were stimulated by short electrical pulses of 1.2-1.5 microseconds duration in order to study the amplitudes and latency characteristics of synaptic responses. It is found that double pulses evoke a synchronized biphasic short-latency synaptic response in the neck muscles, their amplitudes depending on the interpulse delay. Angular acceleration of short pulse trains evoked eye movements in the plane of the simulated canal and the neck which were associated with the nystagmic rhythm. The experimental results are discussed within the framework of the central vestibulo-oculomotor integrator concept.
I.H.

A86-14714
ENCODING OF SPATIAL LOCATION BY POSTERIOR PARIETAL NEURONS
R. A. ANDERSEN, G. K. ESSICK, and R. M. SIEGEL (Salk Institute for Biological Studies, San Diego, CA) Science (ISSN 0036-8075), vol. 230, Oct. 25, 1985, p. 456-458. refs
(Contract NIH-EY-05522)

The cortex of the inferior parietal lobule in primates is important for spatial perception and spatially oriented behavior. Recordings of single neurons in this area in behaving monkeys showed that the visual sensitivity of the retinotopic receptive fields changes systematically with the angle of gaze. The activity of many of the neurons can be largely described by the product of a gain factor that is a function of the eye position and the response profile of the visual receptive field. This operation produces an eye position-dependent tuning for locations in head-centered coordinate space. Author

A86-15444
RADIATION-SICKNESS MECHANISMS [MEKHANIZMY LUCHEVOI PATOLOGII]
IU. B. KUDRIASHOV, ED. (Moskovskii Gosudarstvennyi Universitet, Moscow, USSR) Moscow, Izdatel'stvo Moskovskogo Universiteta, 1984, 140 p. In Russian. No individual items are abstracted in this volume.

Papers are presented concerning biophysical mechanisms of radiation sickness, the modification of cytogenic radiation effects by inhibitors of DNA synthesis, liver cell plasma membranes in animals with different radiation sensitivity, mechanisms of disorders of nitrogen and energy metabolism under ionizing radiation from various sources, and the effect of varying doses of ionizing radiation on the Na(+)-K(+)-ATPase in rat organs of different radiation sensitivity. Also included are papers concerning the injury and recovery of the blood regenerating system in the course of acute radiation sickness, the pathogenesis of the radiation-induced gastrointestinal syndrome, the heterogeneity of the critical systems as the principal factor determining their resistance to radiation, and regulation of the radiation resistance of an organism by altering the metabolic state of cellular mitochondria. In addition, synergistic effects in the radiobiology of bacteria and the general scheme of the modification of the radiation cell damage are discussed. I.S.

A86-15467
VISUAL-CONTRAST MEASUREMENT - MEASUREMENT OF THE SPATIAL TRANSFER FUNCTIONS OF THE VISUAL SYSTEM [VIZOKONTRASTOMETRIIA - IZMERENIE PROSTRANSTVENNYKH PEREDATOCHNYKH FUNKTSII ZRITEL'NOI SISTEMY]
IU. E. SHELEPIN, L. N. KOLESNIKOVA, and IU. I. LEVKOVICH Leningrad, Izdatel'stvo Nauka, 1985, 109 p. In Russian. refs

Theoretical and experimental studies of spatial transfer functions (TFs) of the visual system in normal and pathological vision are reviewed. Particular consideration is given to the interrelationship between the retinoscopic organization of the visual analyzer and the transfer of spatial information in this analyzer; a spatial-frequency analysis of the mechanisms underlying binocular vision; disorders of these mechanisms during amblyopia; and the unified character of spatial-temporal transfer functions. Techniques for the measurement of modulation transfer functions in clinical and experimental conditions are described. B.J.

A86-15474
MOLECULAR MECHANISMS OF CELL DEATH INDUCED BY RADIATION [MOLEKULIARNYE MEKHANIZMY RADIATSIONNOI GIBELI KLETOK]
K. P. KHANSON and V. E. KOMAR Moscow, Energoatomizdat, 1985, 152 p. In Russian. refs

Recent data concerning the mechanisms of radiation-induced cell death are presented. The role of structural and metabolic changes occurring in the genome, membranes, and metabolism of a cell in the course of reproductive, or 'mitotic', death and the interphase death are described. It is shown that the experimental data concerning the radiation dose/cell inactivation relationships can be successfully interpreted by means of different quantitative models for reproductive cell death. Programmed interphase cell death (PICD) is compared with the radiation-induced cell death, and a genetic hypothesis for the PICD is proposed. I.S.

A86-15513
BLOOD CIRCULATION CHANGES IN THE CAROTID ARTERIES POOL CAUSED BY ANTIORTHOSTASIS AND ANTIORTHOSTATIC HYPOKINESIA [IZMENENIE KROVOOBRASHCHENIIA V BASSEINE SONNYKH ARTERII PRI ANTIORTOSTAZE I ANTIORTOSTATICHESKOI GIPOKINEZII]
B. M. FEDOROV, E. N. STRELTSOVA, and T. V. SEBEKINA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 755-762. In Russian. refs

The effect of antiorthostasis (AO) on circulation in the carotid pool was studied in healthy men placed in a -8 deg head-down tilt, and in anesthesized dogs subjected to -45 deg or -90 deg AO. The 5-day-long antiorthostatic hypokinesia in men led to a decreased blood flow in the carotid and orbital arteries, an increase in the peripheral resistance index, a decreased reactivity to the compression test, and a decreased functioning of the flow along the anterior communicating artery when the common carotid was compressed. During the later phases of the 30-day long AO, these blood flow indices tended to return to normal. In dogs, the AO led to a sharp increase in pressure in the jugular veins and in peripherals of the carotid pool, and to a decrease of blood flow rate in the carotid arteries. I.S.

A86-15521
NEUROCHEMICAL BASIS OF CHEMICAL THERMOREGULATION AND ARTIFICIAL HYPOBIOSIS [NEIROKHIMICHESKIE OSNOVY KHIMICHESKOI TERMOREGULIATSII I ISKUSSTVENNYI GIPOBIOZ]
N. N. TIMOFEEV (AMN SSSR, Institut Farmakologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 839-851. In Russian. refs

The state of hypothermia (HT) occurs when contractile or chemical thermogenesis (CT) is uncoupled from noncontractile thermoregulation. A block in CT can be achieved by interfering with the activation of the presynaptic membrane by noradrenaline (NA), thus preventing the release of acetylcholine. Four possible approaches that can be used to induce artificial HT are: depletion of stored NA from its adrenergic or adrenal pool, blocking the NA release, inhibition of catecholamine synthesis, and induction of the synthesis of faulty NA. The methods and drugs available for uncoupling CT by each of the four approaches, as well as various combinations of these, are described, together with the effects produced in the respective experiments. Clinical applications of artificial biogenesis in situations where deceleration of biological or pathological processes would be beneficial to the patient are discussed. I.S.

A86-15525
NEUROCHEMICAL MECHANISMS OF ARTIFICIAL HYPOBIOSIS AND CHEMICAL THERMOREGULATION [NEIROKHIMICHESKIE MEKHANIZMY ISSKUSSTVENNOGO GIPOBIOZA I KHIMICHESKOI TERMOREGULIATSII]
N. N. TIMOFEEV and G. A. KONSTANTINOV (AMN SSSR, Institut Farmakologii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Sept. 1985, p. 1145-1150. In Russian. refs

A state of hypobiosis not coupled with chemical thermoregulatory processes was induced in rats and rabbits by injecting the animals with ornid, a drug known to block the release of neuromediator from the adrenergic neurons. Within 1-2 hrs of i.p. injections (30 mg/kg for rats and 50 mg/kg for rabbits) and 1-2 min of 10 pct i.v./90 pct i.p. injections of ornid, the animals exhibited a 20-30 percent loss in the oxygen consumption and a lowering of emotional/stress reactions. There was no loss of arbitrary mobility or any evidence of shivering, attesting to the attainment of a hypobiotic state that was uncoupled from the chemical thermoregulation processes. The poikilothermic state could be maintained for 5-6 days at room temperature and could

be reversed without the use of any drug, by increasing the body temperature. I.S.

A86-16054
DECOMPRESSION OUTCOME FOLLOWING SATURATION DIVES WITH MULTIPLE INERT GASES IN RATS
R. S. LILLO, E. T. FLYNN, and L. D. HOMER (U.S. Navy, Naval Medical Research Institute, Bethesda, MD) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Nov. 1985, p. 1503-1514. refs
(Contract NAVY TASK M0099PN,01A,0009)

A86-16055
MODE OF NEURAL CONTROL MEDIATING RAT TAIL VASODILATION DURING HEATING
D. S. OLEARY, J. M. JOHNSON, and W. F. TAYLOR (Texas, University, San Antonio) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Nov. 1985, p. 1533-1538. refs
(Contract NIH-HL-20663)

N86-12949*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 2
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., J. E. ROWE, ed., and R. TEETER, ed. Washington NASA Oct. 1985 96 p
(Contract NASW-3676)
(NASA-CR-3922(02); NAS 1.26:3922(02)) Avail: NTIS HC A05/MF A01 CSCL 06C

The second issue of the bimonthly digest of USSR Space Life Sciences is presented. Abstracts are included for 39 Soviet periodical articles in 16 areas of aerospace medicine and space biology and published in Russian during the first half of 1985. Selected articles are illustrated with figures from the original. Translated introductions and tables of contents for 14 Russian books on 11 topics related to NASA's life science concerns are presented. Areas covered are: adaptation, biospheric, body fluids, botany, cardiovascular and respiratory systems, cybernetics and biomedical data processing, gastrointestinal system, group dynamics, habitability and environmental effects, health and medical treatment, hematology, immunology, life support systems, metabolism, musculoskeletal system, neurophysiology, psychology, radiobiology, and space biology. Two book reviews translated from Russian are included and lists of additional relevant titles available either in English or in Russian only are appended. E.A.K.

N86-12950# Army Engineer Waterways Experiment Station, Vicksburg, Miss. Environmental Lab.
ENVIRONMENTAL IMPACT RESEARCH PROGRAM. STATUS AND SOURCE OF HABITAT MODELS AND LITERATURE REVIEWS, DECEMBER 1984 Final Report
T. H. ROBERTS, L. J. ONEIL, and W. E. JABOUR Apr. 1985 18 p Revised
(AD-A156899; WES/MP/EL-85-1-REV) Avail: NTIS HC A02/MF A01 CSCL 06F

This report summarizes the status and availability of selected species habitat models and other habitat-related documents developed by the US Fish and Wildlife Service and other agencies. This listing is not comprehensive since many universities and other organizations are now involved with model development and testing. Animal groups included are birds, mammals, amphibians, reptiles, fish, molluscs, and other crustaceans. Information listed includes scientific name, special status of the species (if any), the organization responsible for the development of the model or the literature review, the stage of development of the document, and whether the document has received outside review or testing. GRA

N86-12951# Los Alamos National Lab., N. Mex.
RAMAN ACTIVITY IN SYNCHRONOUSLY DIVIDING BACTERIA
S. P. LAYNE 1985 12 p refs Presented at the Computer Anal. for Life Sci., Okayama, Japan, 9 Jul. 1985
(Contract W-7405-ENG-36)
(DE85-015672; LA-UR-85-2368; CONF-850784-1) Avail: NTIS HC A02/MF A01

Using a spectrometer equipped with an optical-multichannel analyzer as the detector (OMA), we have observed the Stokes laser-Raman spectra of metabolically active Escherichia coli and Bacillus magaterium from 100 to 2100 cm(-1). After lengthy investigation, no Raman lines attributable to the metabolic process nor the cells themselves were found. Previous Raman spectra of active bacteria cannot be used to support nonlinear theories in biology. DOE

N86-12952# California Univ., Berkeley. Lawrence Berkeley Lab.
MONITORING OF CIRCADIAN WAVEFORMS IN RODENTS EXPOSED TO HIGH-INTENSITY STATIC MAGNETIC FIELDS
T. S. TENFORDE, L. LEVY, and E. VEKLEROV Oct. 1984 38 p refs Presented at the 23rd Hanford Life Sci. Symp., Interaction of Biol. Systems with Static and ELF Elec. and Magnetic Fields, Richland, Wash., 2 Oct. 1984
(Contract DE-AC03-76SF-00098)
(DE85-015225; LBL-18384; CONF-841041-2) Avail: NTIS HC A03/MF A01

A system was developed for the noninvasive monitoring of circadian variables in mice exposed to a 1.50 T static magnetic field. The ambient light level, temperature and relative humidity within the exposure chamber are closely regulated, and physiological monitoring systems provide simultaneous measurements of seven circadian variables: (1) climbing activity on a triangular bar; (2) migratory activity; (3) body mass; (4) respired carbon dioxide; (5) nutrient consumption; (6) urine excretion; and (7) fecal excretion. Data from the various transducers and environmental monitoring devices within the exposure system are recorded on magnetic tape at 5-min intervals throughout experiments of 50 to 60 days duration, and the circadian waveforms of behavior and physiological parameters are analyzed by a modification of the cosiner method using a high-speed computer. Exposure of adult female LAF-1 mice to a 1.50-T homogeneous field for 5 continuous days, or for 10 consecutive days with intermittent daily exposures on an 8-hr-on/16-hr-off cycle, is found to produce no significant alterations in the circadian waveforms of behavioral or physiological parameters. DOE

N86-12953# Oak Ridge National Lab., Tenn.
BIOMEDICAL AND ENVIRONMENTAL SCIENCES PROGRAM PUBLICATIONS 1984
H. E. GERSTNER, K. M. BRANAM, L. W. LITTLETON, V. S. NORMAN, and E. H. THOMPSON Jul. 1985 86 p
(Contract DE-AC05-84OR-21400)
(DE85-015070; ORNL-6201) Avail: NTIS HC A05/MF A01

A bibliography is given containing 665 references to journal articles, books, book chapters, proceedings, reports, and abstracts. Certain types of publications are not included: theses, book reviews, internal documents, and periodic progress reports (with the exception of annual reports). Publications from divisions that report to the Associate Laboratory Director for Biomedical and Environmental Sciences (ADBES) are listed here, as well as publications from divisions that receive funding through the ADBES office. The references are sorted by type (journal articles, etc.), then by division, and, within each division, alphabetically by first author. Author and journal indexes are included in the back. DOE

N86-13878*# Louisville Univ., Ky. Dept. of Microbiology and Immunology.
DEVELOPMENT AND TESTING OF A MOUSE SIMULATED SPACE FLIGHT MODEL Semiannual Progress Report, May - Oct. 1985
G. SONNENFELD 1985 6 p refs
(Contract NCC2-213)
(NASA-CR-176359; NAS 1.26:176359; SAPR-6) Avail: NTIS HC A02/MF A01 CSCL 06C

The development and testing of a mouse model for simulating some aspects of weightlessness that occur during space flight, and the carrying out of immunological flight experiments on animals was discussed. The mouse model is an antiorthostatic, hypokinetic, hypodynamic suspension model similar to the one used with rats. It is shown that this murine model yield similar results to the rat model of antiorthostatic suspension for simulating some aspects of weightlessness. It is also shown that mice suspended in this model have decreased interferon-alpha/beta production as compared to control, nonsuspended mice or to orthostatically suspended mice. It is suggested that the conditions occuring during space flight could possibly affect interferon production. The regulatory role of interferon in nonviral diseases is demonstrated including several bacterial and protozoan infections indicating the great significance of interferon in resistance to many types of infectious diseases. E.A.K.

N86-13879*# National Aeronautics and Space Administration, Washington, D.C.
LIFE SCIENCES ACCOMPLISHMENTS
Sep. 1985 95 p refs Original contains color illustrations
(NASA-TM-88177; NAS 1.15:88177) Avail: NTIS HC A05/MF A01 CSCL 06C

From its inception, the main charter of Life Sciences has been to define biomedical requirements for the design and development of spacecraft systems and to participate in NASA's scientific exploration of the universe. The role of the Life Sciences Division is to: (1) assure the health, well being and productivity of all individuals who fly in space; (2) study the origin, evolution, and distribution of life in the universe; and (3) to utilize the space environment as a tool for research in biology and medicine. The activities, programs, and accomplishments to date in the efforts to achieve these goals are detailed and the future challenges that face the division as it moves forward from the shuttle era to a permanent manned presence in space space station's are examined. E.A.K.

N86-13880# Wisconsin Univ., Madison.
STUDY OF TOXIC AND ANTIGENIC STRUCTURES OF BOTULINUM NEUROTOXINS Annual and Final Report, 1 Aug. 1980 - 31 Aug. 1984
B. R. DASGUPTA Feb. 1985 14 p
(Contract DAMD17-80-C-0100; DA PROJ. 3M1-62770-A-871)
(AD-A156642) Avail: NTIS HC A02/MF A01 CSCL 06E

Amino acid compositions of botulinum neurotoxin (NT) types A, B, E and F were determined. The heavy and light chains of types A, B and E NT were separated, purified, and analyzed for amino acid compositions and partial N-terminal sequence. Selective modification of tyr, his and arg residues and also carboxyl and amino groups of types A and E NT demonstrated the role of these amino acid residues in toxicity and antiquenicity. Type E NT completely detoxified following modification of his, tyr or amino groups has potential as a toxoid. Effects of types A and B NT on rat neuromuscular junctions appear non-identical. Author (GRA)

N86-13881# Systems and Applied Sciences Corp., Anaheim, Calif.
NEW PHYSICAL METHODS FOR BIOLOGICAL AEROSOL DETECTION Contractor Report, Aug. 1982 - Sep. 1984
C. C. CHOU and M. LU May 1985 99 p
(Contract DAAK11-82-C-0113)
(AD-A158218; CRDC-CR-84131) Avail: NTIS HC A05/MF A01 CSCL 15B

For biological aerosol detection, Fourier transform secondary negative ion mass spectrometry appears to be on the forefront among various new analytical methods evaluated. Various gases liberated upon pyrolyzing bacterial cells lead to several possible techniques. Preliminary experimental results indicated an integrated detection system incorporating non-dispersive IR spectroscopy, piezoelectric sensing, and optical density change measurement would render a fast, accurate detection for pyrolysis gaseous products. GRA

N86-13882# Stanford Univ., Calif.
SMALL X-RAY DIFFRACTION OF IMMUNOGLOBULIN-MEMBRANE COMPLEXES Final Technical Report, 15 Apr. 1981 - 14 Oct. 1984
S. DONIACH and K. HODGSON 15 Aug. 1985 8 p
(Contract N00014-81-K-0496)
(AD-A158252) Avail: NTIS HC A02/MF A01 CSCL 06A

In the first part of this research, specially designed hapten-phospholipid molecules were synthesized to enable the binding of immunoglobulins to artificial phospholipid membranes. In subdequent work, using these immunoglobulin-membrane complexes, electron microscopy was used to reveal the detailed crystalline structure of a two dimensional (2D) immunoglobulin crystal attached to an electron microscope grid. These studies enabled the discovery of a new conformational arrangement of crystals formed from intact immunoglobulin molecules. In a third part of the study, monolayers of protein-membrane complex (in this case the purple membrane from halobacterium halobium) were deposited on a single crystal silicon substrate. Using the technique of grazing incidence X-ray diffraction, diffraction patterns from a single monolayer of protein-lipid complex were obtained for the first time. GRA

N86-13883# Battelle Northwest Labs., Richland, Wash.
DESIGN, CONSTRUCTION AND TESTING OF A DC BIOEFFECTS ENCLOSURE FOR SMALL ANIMALS Final Report
Jul. 1985 180 p refs Sponsored by EPRI
(Contract DE-AC06-76RL-01830; EPRI PROJ. 1774-1)
(DE05-016798; EPRI-EA-4189) Avail: NTIS HC A09/MF A01

Large air-ion concentrations moving in high-strength static electric fields are unique to the environment near high-voltage dc (HVdc) transmisison lines. To assess the possible biological effects of this environment, a small-animal exposure system was designed to produce well-characterized levels of the major components of the HVdc environment. Initial steps in the development of this exposure system included studies of various housing geometries and housing materials. Dielectric materials, such as plexiglass and lexan, unacceptably perturbed electric-field and air-ion environments in their vicinity these perturbations depended on the cleanliness of the housing materials and were spatially and temporally variable. Semiconducting materials were also investigated, with satisfactory results. The final cage design employs semiconducting glass walls which span the entire space between the grounded metal-screen cage floors the overhead high-voltage electrodes used to generate the exposure electric fields. The surface conductivity of the glass walls is controlled by a system of energized guard strips located on the outer surfaces of the walls. Electric-field strengths up to 100 kV/m and air-ion concentrations up to 1,000,000 cu b c, are attainable. Initial dosimetric measurements were also performed as part of this project. The ion current collected by the body of a grounded animal was measured as a function of ion concentration and electric-field strength. The ion current collected by a live animal was observed to be significantly less than that collected by a

conducting animal model of similar size and shape. This deviation appears to be due to accumulation of electric charge on the fur of exposed animals. DOE

N86-13884# Washington Univ., Seattle. Social Management of Technology Program.
MOLECULAR MECHANISMS OF MUTAGENESIS DETERMINED BY THE RECOMBINANT DNA TECHNOLOGY
W. R. LEE 1985 10 p refs Presented at the 4th Intern. Conf. on Environ. Mutagens, Stockholm, 24 Jun. 1985
(Contract DE-AS05-76EV-03728)
(DE85-016353; CONF-8506137-11) Avail: NTIS HC A02/MF A01

A study of the alteration of the DNA in the mutant gene can determine mechanisms of mutation by distinguishing between mutations induced by transition, transversion, frameshifts of a single base and deletions involving many base pairs. The association of a specific pattern of response with a mutagen will permit detecting mutants induced by the mutagen with a reduced background by removing mutations induced by other mechanisms from the pool of potential mutants. From analyses of studies that have been conducted, it is quite apparent that there are substantial differences among mutagens in their modes of action. Of 31 X-ray induced mutants, 20 were large deletions while only 3 showed normal southern blots. Only one mutant produced a sub-unit polypeptide of normal molecular weight and charge in the in vivo test whereas in vitro synthesis produced a second one. In contrast, nine of thirteen EMS induced mutants produced cross-reacting proteins with sub-unit polypeptide molecular weights equivalent to wild type. DOE

N86-13885# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES Project Technical Status Report, 16 Feb. - 12 Apr. 1985
W. R. ROGERS 19 Apr. 1985 33 p
(Contract DE-AC02-80RA-50219)
(DE85-011992; DOE/RA-50219/T4) Avail: NTIS HC A03/MF A01

The objective was to investigate possible behavioral effects of exposure to high-intensity 60 Hz electric fields. Four projects are conducted: (1) aversive sensory character of exposure to fields, (2) threshold intensity for detection of fields, (3) chronic exposure effects on performance of two operant tasks, and (4) observation of behavior of social groups under chronic exposure. Electric field testing with animals has begun. Behavioral testing was suspended for repair of cages and to suppress corona, and to conduct engineering tests. DOE

N86-14080*# Fayetteville State Univ., N.C. Dept. of Biology.
THE SCANNING ELECTRON MICROSCOPE AS A TOOL IN SPACE BIOLOGY Final Report
R. A. BARRETT *In* NASA. Johnson (Lyndon B.) Space Center The 1983 NASA/ASEE Summer Faculty Fellowship Research Program Research Reports 9 p Sep. 1983 refs
Avail: NTIS HC A18/MF A01 CSCL 06B

Normal erythrocytes are disc-shaped and are referred to here descriptively as discocytes. Several morphologically variant forms occur nomally but in rather small amounts, usually less than one percent of total. It has been shown though, that spiculed variant forms referred to as echinocytes are generated in significant amounts at zero g. Normal red cells have been stressed in vitro in an effort to duplicate the observed discocyte-echinocyte transformation at zero g. The significance of this transformation to extended stay in space and some of the plausible reasons for this transformation are discussed. Author

N86-14088*# North Texas State Univ., Denton. Dept. of Biological Sciences.
INTERACTION BETWEEN ESCHERICHIA COLI AND LUNAR FINES Final Report
K. R. JOHANSSON *In* NASA. Johnson (Lyndon B.) Space Center The 1983 NASA/ASEE Summer Faculty Fellowship Research Program Research Reports 21 p Sep. 1983 refs
Avail: NTIS HC A18/MF A01 CSCL 06B

A sample of mature lunar fines (10084.151) was solubilized to a high degree (about 17 percent) by the chelating agent salicylic acid (0.01. M). The neutralized (pH adjusted to 7.0) leachate was found to inhibit the growth of Escherichia coli (ATCC 259922) in a minimial mineral salts glucose medium; however, the inhibition was somewhat less than that caused by neutralized salicylic acid alone. The presence of lunar fines in the minimal medium was highly stimulatory to growth of E. coli following an early inhibitory response. The bacterium survived less well in the lunar leachate than in distilled water, no doubt because of the salicylate. It was concluded that the sample of lunar soil tested has nutritional value to E. coli and that certain products of fermentation helped to solubilize the lunar soil. Author

N86-14097*# Morgan State Univ., Baltimore, Md.
COMPARATIVE EFFECT OF LUNAR FINES AND TERRESTRTRIAL ASH ON THE GROWTH OF A BLUE-GREEN ALGA AND GERMINATING RADISH SEEDS Final Report
E. J. RIDLEY *In* NASA. Johnson (Lydon B.) Space Center The 1983 NASA/ASEE Summer Faculty Fellowship Research Program Research Reports 15 p Sep. 1983 refs
Avail: NTIS HC A18/MF A01 CSCL 06B

Although it is understood that photosynthetic organisms will be required as components of a closed ecological life support system (CELSS) for a manned lunar based, a basic problem is to identify organisms best capable of utilizing lunar regolith materials. Also, there is need to determine what nutrient supplements have to be added to lunar soils, and at what levels in order to promote high bio-mass production. Author

N86-14162# Joint Publications Research Service, Arlington, Va.
ENERGY EXCHANGE OF PLANTS UNDER WEIGHTLESSNESS CONDITIONS Abstract Only
M. G. TAIRBEKOV and A. V. DEVYATKO *In its* USSR Rept.: Space (JPRS-USP-85-005) p 80 30 Sep. 1985 Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 280, no. 2, Jan. 1985 p 509-512 Original language document announced in IAA as A85-24193
Avail: NTIS HC A08

The plant energy-transfer experiment aboard the Cosmos-1514 biosatellite in December 1983 is considered. Heat release from corn sprouts was measured by a biocalorimeter operating in the 0 to 100 mW range. Results indicate that weightlessness has no effect on the intensity of energy transfer in sprouting seeds. The design of the biocalorimeter is described in some detail. IAA

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-13298
PREDICTION OF THE FUNCTIONAL STATE OF THE BODY DURING ADAPTATION TO HIGH ALTITUDES [PROGNOZ FUNKTSIONAL'NOGO SOSTOIANIIA ORGANIZMA PRI ADAPTATSII K VYSOKOGOR'IU]
V. P. MAKHNOVSKII, E. I. KUZIUTA, and E. E. VOLKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1985, p. 50-52. In Russian.

The endurance of the cardiovascular system of 111 men aged 18-20 years was measured by the Flack stress method, first after a 20-day stay at 1700 m above sea level, and then during a 60-day adaptation to 3600 m. A control group remained at 800 m. The heart rate (HR), and the cystolic (CP) and mean arterial pressures were measured before and after stress, and the Kerdo index of the vegetative system (VIK) was calculated. According to the endurance results at 1700-m altitude, all men cold be grouped into 'strong' (S) and 'weak' (W) categories. The W group displayed sharp changes in HR and CP, which were only minimal and transitory in men of the S group. The changes in the VIK were negative and transitory in the S group, and positive in the W group. The results at 3600 m have confirmed the prognosis made at the lower altitude: the functional parameters in the subjects of the S group returned to normal after only 30 days of adaptation, while the W group remained unadapted even after 60 days. I.S.

A86-13299
DETERMINATION OF VESTIBULAR ASYMMETRY WITH APPLICATION TO AVIATION MEDICINE [OPREDELENIE VESTIBULIARNOI ASIMMETRII PRIMENITEL'NO K ZADACHAM VRACHEBNO-LETNOI EKSPERTIZY]
E. V. LAPAEV and O. A. VOROBEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1985, p. 53-56. In Russian. refs

Nystagmic (N), vestibulo-spinal (V-S) and vestibulo-vegetative stability (V-VS) reactions, both spontaneous and those caused by rotatory and caloric stimulations of the semicircular canals, were measured in pilots, flight trainees and non-flying (C) subjects. It was found that the V-S asymmetry increased in all subjects after 12-hr night-time wakefulness. The N and V-S asymmetries were significantly lower in the flight crew and trainees than in C subjects. Some pilots disclosed hidden functional asymmetry after prolonged flights. The methods of testing, its evaluation, and the need for additional analyses (concerning the changing character of the expression and direction of the N, V-S and V-VS asymmetry reactions) are discussed. I.S.

A86-13300
THE USE OF REFLEX THERAPY IN THE PROPHYLAXIS AND TREATMENT OF MOTION SICKNESS [ISPOL'ZOVANIE REFLEKSOTERAPII V PROFILAKTIKE I LECHENII UKACHIVANIIA]
A. L. IVANOV and V. M. SNITKO Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Aug. 1985, p. 56, 57. In Russian. refs

The results of measuring the electric conductivity (EC) at 24 acupuncture relief points (APs) known to be most functionally labile and to reflect the state of the twelve standard acupuncture channels are reported. It was found that the channels of the heart, three torso sections, spleen-pancreas, small intestine, and urinary bladder were most indicative in terms of the changes of EC. The changes in EC were either negative (APs in the channels of the trunk and small intestine) or positive (in the other three channels). Based on these results the electropuncture method was used successfully to ameliorate the symptoms of sea sickness in the sensitive crew and passengers during long-term sea trips. I.S.

A86-13567
COMPLETE RIGHT BRANCH BLOCKING AND THE FLIGHT FITNESS OF PILOTS [BLOC DE BRANCHE COMPLET GAUCHE ET APTITUDE A L'EMPLOI DANS LE PERSONNEL NAVIGANT]
J. P. OLLIVIER, J. DRONIOU (Hopital d'Instruction des Armees Val-de-Grace, Paris, France), G. LEGUAY, and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 143-147. In French. refs

The rates, ages of occurrences and noninvasive means of detecting complete right branch blocking (CBB) in pilots is examined, together with the implications of CBB for flight fitness certification. A study was performed of 23 middle-aged humans with CBB and no previous history of cardiac problems or symptoms. The subjects submitted to ECG, echocardiography, myocardial scintography, angiography, coronography and catheterization. No correlation was found between risk factors, e.g., smoking, cholesterol intake and high blood pressure, and CBB. A series of tests were developed for identifying asymptomatic CBB. The onset of symptoms is considered sufficient reason to perform a catheterization. It is concluded that although there is only a 15 percent chance of detecting CBB, the seriousness of the condition is sufficient reason for conducting a series of tests on middle-aged pilots, who cannot be certified as flight-fit if CBB is found. M.S.K.

A86-13568
POSITIVE PRESSURE RESPIRATION, A MEANS OF PROTECTING AGAINST +GZ ACCELERATIONS - A THEORETICAL APPROACH [LA RESPIRATION EN PRESSION POSITIVE, MOYEN DE PROTECTION CONTRE LES ACCELERATIONS +GZ - APPROCHE THEORIQUE]
H. MAROTTE and H. VIEILLEFOND (Centre d'Essais en Vol, Bretigny-sur-Orge, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 147-149. In French. refs

A literature review was carried out to examine the possibility that deep breathing by pilots of jet aircraft will serve as a replacement for M1 maneuvers to offset long duration high-g acceleration-induced loss of functioning. The object of deep breathing, as with the M1 maneuver, is to enhance the arterial cerebral perfusion of blood. It was found that deep breathing must commence before initiating high-g maneuvers, a difficult task in flight combat conditions. Finally, there is a limit to the length of time that deep breathing can safely be performed. M.S.K.

A86-13572
NONHYPOXIC SYNCOPES AT HIGH ALTITUDE - THE RESULTS OF TWO OBSERVATIONAL TRIALS IN A HYPOBARIC CHAMBER [SYNCOPES NON HYPOXIQUES EN ALTITUDE - A PROPOS DE DEUX OBSERVATIONS EN CAISSON HYPOBARE]
H. MAROTTE, H. VIEILLEFOND, and J. POIRIER (Centre d'Essais en Vol, Bretigny-sur-Orge, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 169-172. In French.

Two instances of loss of consciousness were observed in successive trials with subjects in a pressure chamber. One subject sat for 120 min at a simulated 17,000 ft altitude; the second trial simulated a climb to 60,000 ft, while being supplied with oxygen at a level equivalent to 128 kPa. The second subject lost consciousness during simulated descent, following the onset of hyperventilation 40 min into the session. With regard to fighter pilots, the first subject behaved as if experiencing an anxiety attack prior to blacking out. Either unconscious episode could have occurred to pilots in high altitude flight; neither would be detectable by post-accident investigations. M.S.K.

A86-13573
THE BENDS AT HIGH ALTITUDE [LA MALADIE DE DECOMPRESSION D'ALTITUDE]
H. VIEILLEFOND Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 185-193. In French.

Aircrew can experience the bends after sudden decompression in high altitude flight. The bends is the formation of N2 gas bubbles in the muscle tissues as the gas escapes the bodily fluids due to a lowered partial pressure of the atmosphere holding the gas in the liquids. An analysis is carried out of the processes by which some of the excess N2 is expelled through the lungs, while too slow an expulsion allows bubbles to form. The pressure differential has to be from 1.5-1.6 for the bubbles to form. Consideration is also given to the effects of the temporal duration at an altitude, the age and sex of the person, the ambient temperature, and protective measures (e.g., denitrogenation). M.S.K.

A86-13941#
INVESTIGATION OF EUSTACHIANAL FUNCTION IN JASDF PILOTS BY NEW APPARATUS. I - ON THE PRESSURAL REGULATION OF THE EUSTACHIAN TUBE IN NORMAL HUMAN
J. OKUBO, Y. MANO, M. SHIBAYAMA, S. TAKAHASHI, N. DOI (Tokyo Medical and Dental University, Japan) et al. Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, June 1985, p. 41-48. In Japanese, with abstract in English. refs

A device has been designed and built to measure the sound pressure inside the Eustachian tube during the ventilation process. The device, a sonotubometer operates using a 7-kHz octave band noise which corresponds to the low frequency sound load of the Eustachian tube. Sonotubometer measurements of the duration and amplitude of sound during dry swallowing were obtained in children and adult men and women in order to evaluate the effectiveness of the device. The results were used to calibrate the device for high-altitude measurements of Eustachian sound in JASDF pilots. I.H.

A86-14310
PSYCHOMOTOR PERFORMANCE AFTER FORWARD-FACING IMPACT
B. F. HEARON and J. W. BRINKLEY (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1043-1051. refs
(Contract F33615-83-C-0500)

The effect of a forward-facing whole-body impact (-Gx) on psychomotor performance (PP) was studied on ten male subjects using the manikin psychomotor task (Reader et al., 1981), which is a complex reaction time and response accuracy test. The impact severity (at 0, 8, 10, and 12 G levels) was tested in the AFAMRL Horizontal Decelerator Facility, using two initial head positions (up or forward) at the 12 G impact level. No statistically significant evidence of impaired PP upon the increasing severity of impact was found in this test. However, significantly lower angular head acceleration was observed at 12 G when the head was prepositioned forward and downward prior to the impact than when it was positioned upright, strapped against the headrest. Thus, the potential for temporary stunning of aircrew personnel during an operational crash landing or ditching may be reduced by positioning the head forward and downward, if time permits, prior to an imminent crash. I.S.

A86-14312* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BLOOD PRESSURE AND PLASMA RENIN ACTIVITY AS PREDICTORS OF ORTHOSTATIC INTOLERANCE
M. H. HARRISON, S. E. KRAVIK, G. GEELEN, L. KEIL, and J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1059-1064. refs

The effect of 3 h standing, followed by a period of head-up tilt (HUT) on physiological response (orthostatic tolerance, blood pressure and heart rate), as well as on plasma vasopressin (PVP) and renin activity (PRA) were studied in 13 dehydrated (to 2.4 pct loss of body weight) subjects. Seven subjects showed signs of orthostatic intolerance (INT), manifested by sweating, pallor, nausea and dizziness. Prior to these symptoms, the INT subjects exhibited lower systolic (SP) and pulse (PP) pressures, and an elevated PRA, compared to the tolerant (TOL) subjects. HUT has aggravated increases of RPA in the INT subjects and caused an increase, higher than in TOL subjects, in PVP, while rehydration has greatly attenuated the PVP response to the HUT and decreased the PRA response. It is concluded that dehydration, together with measurements of SP, PP and PRA, may serve as a means of predicting orthostatic intolerance and may provide a physiological model for studying the causes of intolerance. I.S.

A86-14315
TACHYGASTRIA AND MOTION SICKNESS
R. M. STERN, K. L. KOCH, H. W. LEIBOWITZ, I. M. LINDBLAD, C. L. SHUPERT (Pennsylvania State University, University Park) et al. Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1074-1077. refs
(Contract NIH-EY-03276)

Cutaneously-recorded electrogastrograms (EGGs) were obtained from 21 healthy volunteers who were seated within a drum, the rotation of which produced vection or illusory self-motion. Fourteen subjects developed symptoms of motion sickness during vection and in each the EGG frequency shifted from the normal 3 cpm to 5-8 cpm, tachygastria, an abnormal pattern. In 6 of 7 asymptomatic subjects, the 3 cpm EGG pattern was unchanged during vection. It was concluded that illusory self-motion produces tachygastria and motion sickness in susceptible subjects. Author

A86-14316
ALDOSTERONE, CORTISOL, AND ELECTROLYTE RESPONSES TO HYPOBARIC HYPOXIA IN MODERATE-ALTITUDE NATIVES
C. M. MARESH, B. J. NOBLE, K. L. ROBERTSON, and J. S. HARVEY, JR. (Wyoming, University, Laramie; Midwest Research Institute, Kansas City, MO) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1078-1084. Research supported by the University of Wyoming. refs

The effect of 2-d decompression at simulated high altitude (4270 m, 447 mm Hg) on blood and urine aldosterone (Aldo), cortisol (C), and electrolyte concentrations, all measured three times a day, were studied in seven low-altitude (373 m, 740 mg Hg) natives, LAN, and nine moderate-latitude (1830-2200 m, 585 mg Hg) natives, MAN, aged 19-25 yr. The LAN group has demonstrated higher serum C concentration and respiration rates, and lower serum Aldo and K concentrations, as well as lower urinary Aldo, Na and K concentrations at certain times during decompression, compared to their home values. On the other hand, the respective parameters in the MAN group were basically unchanged at the high altitude. Moreover, manifestations of acute mountain sickness at 4270 m were significantly lower in the MAN than in the LAN group, indicating smaller effect of the drop of ambient oxygen tension in the MAN group. I.S.

A86-14317
CARDIORESPIRATORY FITNESS AND COGNITIVE PERFORMANCE BEFORE AND AFTER CONFINEMENT IN A NUCLEAR SUBMARINE
B. L. BENNETT, C. L. SCHLICHTING, and K. R. BONDI (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1085-1091. Navy-supported research. refs

A86-14318
BLOOD PRESSURE LEVELS OF ACTIVE PILOTS COMPARED WITH THOSE OF AIR TRAFFIC CONTROLLERS
C. F. BOOZE, JR. (FAA, Civil Aeromedical Institute, Oklahoma City, OK) and L. S. SIMCOX (Oklahoma, University, Okalahoma City) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1092-1096. refs

Currently some 15,212 active airmen are certified to fly with a diagnosis of hypertension. Federal Aviation Administration blood pressure standards for certification of airmen are considered to be quite liberal. A systematic sample of pre-strike air traffic controllers was extracted from automated medical files maintained by the Aeromedical Certification Branch of the Civil Aeromedical Institute for comparison with airman data. Distributions of blood pressure by age were compared by using conventional non-parametric techniques for 10-year age intervals. Data were also compared with general population findings. Prevalence of hypertension is greater in the general United States population than found with any of the groups reported here. Prevalence of borderline and definite hypertension is seen to increase with age for all groups studied. Prevalence of any degree of hypertension is lower for airline pilots than either the all-airmen group or the air traffic controller group. Author

A86-14319
EFFECT OF EXPOSURE TO HEAT, HYPOXIA, COLD, ACCELERATION, AND VIBRATION STRESS ON THE TOTAL BLOOD SULFHYDRYL GROUPS IN HUMAN SUBJECTS
E. M. IYER, M. B. DIKSHIT, and S. SURYANARAYANA (Indian Air Force, Institute of Aviation Medicine, Bangalore) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1097-1101. Sponsorship: Indian Armed Forces. refs
(Contract IARF PROJECT 1247/1981)

The effect of various types of stress on the rate of utilization of the total blood thiols (bl-SH), measured as an index of activity of the hypophyseal-sympathoadrenocortical (H-SAC) system, was studied in 100 healthy air force personnel. Total bl-SH changes caused by exposures to elevated temperature and relative humidity (RH), cold pressure test, hypoxia, acceleration, low-frequency vibration, and head-up tilt were measured by the method of Ellman. Exposure to a hot, dry environment (57 C, 25 pct RH) and hot, humid environment (50 C, 50 pct RH) and to 4572 m simulated altitude for 50 min, all caused significant decreases in bl-SH (49.7, 61.0 and 36.7 pct, respectively), as did a 2-min long hand immersion into 4 C water (42.7 pct decrease) and acceleration (to up to 4.3 Gz for various periods of time), indicating a stimulating effect of these stresses on the H-SAC system. On the other hand, sinusoidal vibration at 4.9 Hz caused a 42.7 percent rise in bl-SH, suggesting inhibition of the H-SAC system by this stress. The 70 deg head-up tilt produced no change in bl-SH. I.S.

A86-15443
UNSTEADY BLOOD FLOW IN HUMANS UNDER ARTIFICIAL CONDITIONS [NESTATSIONARNYI KROVOTOK U CHELOVEKA V ISKUSSTVENNYKH USLOVIIAKH]
E. N. MESHALKIN, I. P. VERESHCHAGIN, IU. A. VLASOV, E. E. LITASOVA, G. N. OKUNEVA et al. Novosibirsk, Izdatel'stvo Nauka, 1984, 232 p. In Russian. refs

Physiological studies of human body under conditions of anethesia and light hypothermia during open-heart surgery are presented. It is concluded that the disengaging the heart from the rest of the cardiovascular system does not result in complete cessation of blood flow and vital processes, i.e., in clinical death. Low level of metabolism and limited capillary blood flow are maintained. However, application of protective measures during the cardiac disengagement is necessary for the support of the body metabolism. The protective effect of limited biothermia during the open-heart surgery is discussed. The observed changes in the blood cell morphology, lymph flow, and immunoglobulins during interrupted cardiovascular circulation indicate an increased level of lymph circulation within the closed system consisting of tissue capillaries, intercellular fluid, lymphatic vessels, central lymph stream, vena cava superior, peripheral veins, and vascular capillaries. I.S.

A86-15512
ELECTROENCEPHALOGRAMS AND THE READ-OUT OF INFORMATION IN THE VISUAL CORTEX DURING IMAGE RECOGNITION [ELEKTROENTSEFALLOGRAMMA I SCHITYVANIE INFORMATSII V ZRITEL'NOI KORE CHELOVEKA PRI OPOZNANII OBRAZOV]
I. A. SHEVELEV, N. B. KOSTELIANETS, V. M. KAMENTOVICH, G. A. SHARAEV, and V. A. ILIANOK (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 707-711. In Russian.

A86-15514
HEMODYNAMICS DURING SHORT-TERM APPLICATION OF LOWER BODY NEGATIVE PRESSURE [GEMODINAMIKA PRI KRATKOVREMENNOM OTRITSATEL'NOM DAVLENII NA NIZHNIUIU CHAST' TELA]
M. M. MIRRAKHIMOV, T. A. AZHIMAMATOV, and T. B. BALTABAEV (Kirgizskii Nauchno-Issledovatel'skii Institut Kardiologii, Frunze, Kirgiz SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 763-769. In Russian. refs

The effect of lower body negative pressure (LBNP) on the cardiovascular functions was studied in 42 normal male subjects aged 31-64 yrs, using noninvasive methods of electrocardiography, phonocardiography and tetrapolar thoracic rheography. The responses to the LBNP included increases in heart rate and in systemic vascular pressure, decreases in the heart rate and the cardiac indices as well as in the volumes of the cardiac chambers, caused by partial detainment of blood in the large-capacity blood vessels of the lower body. The degree of these changes depended on the magnitude of applied LBNP, which was in the range of 20-60 mm. Rapid (2-3 sec) decompression caused the temporarily detained blood to enter the circulation, leading to short-term increases of the cardiac volume load and to reversal of the hemodynamic effects caused by the LBNP. I.S.

A86-15515
TYPOLOGICAL ANALYSIS OF CENTRAL AND PERIPHERAL HEMODYNAMICS DURING ORTHOSTASIS IN NORMAL SUBJECTS AND IN PATIENTS WITH ARTERIAL HYPERTONIA [TIPOLOGICHESKII ANALIZ TSENTRAL'NOI I PERIFERICHESKOI GEMODINAMIKI V ORTOSTATIKE U ZDOROVYKH LITS I BOL'NYKH S ARTERIAL'NOI GIPERTONIEI]
V. A. DARTSMELIIA, G. S. BELKANIIA, and A. N. DEMIN (AMN SSSR, Nauchno-Issledovatel'skii Institut Eksperimental'noi Patologii i Terapii, Sukhumi, Georgian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 770-777. In Russian. refs

The effect of active orthostasis (OS) on the hemodynamics of the central and peripheral circulation systems was studied in normal subjects and in patients in the first and second stages of arterial hypertonia (AH). The hemodynamic shifts and changes in the redistribution indices brought about by OS relative to the clinostatic (control, C) state were measured by use of tetrapolar rheography. The characteristic parameters were measured 30 min after the subjects were put into horizontal position, and then 1, 5, 10, 15, and 20 min after they were transferred into the state of OS. Three orthostatic types of circulation were observed in both C and AH subjects. The observed differences in the circulation types and the changes in the redistribution shifts effected by the OS in both groups of subjects are discussed from the viewpoint of the diagnosis of AH severity and possible therapeutic applications. I.S.

A86-15516
TYPES OF WORK CAPACITY AND THE FREQUENCY OF THE DEVELOPMENT OF ISCHEMIC HEART DISEASE AND HYPERTONIC DISEASE [TIPY RABOTOSPOSOBNOSTI I CHASTOTA RAZVITIIA ISCHEMICHESKOI BOLEZNI SERDTSA I GIPERTONICHESKOI BOLEZNI]
I. IU. BORISOVA, N. A. KRUCHININA, and S. V. CHERNIGOVSKAIA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 778-782. In Russian. refs

A test was conducted on 309 male engineers, who were divided into two types according to the circadian rhythm of their work capacity (WC): (1) the differentiated (D) type, whose WC is optimal either in the morning or in the evening; and (2) the undifferentiated (UD) type, whose WC was uniform throughout the day. All subjects were tested for arterial hypertension (AH) and for heart ischemia (HI) in the beginning of the study and 6.5 years later. The rate of occurrence of the initially diagnosed HI disease was twice as high in the subjects of the D type than in the UD subjects, while the frequency of AH was found to be unrelated to the WC type. Six years later, new cases of HI disease among the first-time suspected HI subjects were found to occur 2.5 times as frequently in the D subjects than in the UD subjects. Moreover, in the subjects with initially marginal AH, new cases of hypertension occurred twice as often in the D types than in the UD subjects. I.S.

A86-15517
BIOPHYSICAL BASIS OF THE TWO-COMPONENT ANALYSIS OF BIOSIGNALS OF THE PULSED FILLING OF THE BLOOD VESSELS [BIOFIZICHESKIE OSNOVY METODA DVUKHKOMPONENTNOGO ANALIZA BIOSIGNALOV PUL'SOVOGO KROVENAPOLNENIIA]
I. V. SOKOLOVA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 783-787. In Russian. refs

A86-15518
COMPARISON BETWEEN THE ANTIHYPOXIC EFFECTIVENESS OF DRUGS AND PRESSURE-CHAMBER TRAINING [SRAVNITEL'NAIA KHARAKTERISTIKA ANTIGIPOKSICHESKOI EFFEKTIVNOSTI FARMAKOLOGICHESKIKH PREPARATOV I BAROKAMERNOI TRENIROVKI CHELOVEKA]
E. A. KOVALENKO, A. IU. KATKOV, V. L. POPKOV, M. P. BOBROVNITSKII, R. N. CHABDAROVA et al. Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 808-813. In Russian. refs

Resistance to induced acute hypoxia (AH) was determined in subjects before and after 3-day training (three daily 1-hr periods) in an altitude chamber at either 5000, 6000, or 7500 m, with or without exercise and compared to the effect produced by a single dose of antihypoxic drugs, tiguril and sidnocarb. AH was induced by either a rapid (20 m/sec) rise to high altitude (Method I) or successive 10-min periods at 5000, 6000, etc., up to 10,000 m altitude levels (Method II) and was monitored by measuring the heart beat frequency, breathing frequency, arterial pressure, respiration volume, and by electroencephalography. Resistance to AH induced by either method could be significantly increased by 3-day training at 6000 m and above, with no effect of physical exercise, and remained high for the next 10 or 20 days. Single doses of tiguril (25 mg/kg) or sidnocarb (0.35 mg/kg) were as effective as high-altitude training against AH induced by Method II but not by Method I. I.S.

A86-15519
LEUKOCYTIC REACTIONS CAUSED BY EMOTIONAL STRESS [LEIKOTSITARNYE REAKTSII PRI EMOTSIONAL'NOM NAPRIAZHENII]
N. M. PLOTNIKOVA, E. V. BELOVA, and T. A. PALOSOVA (Moskovskii Meditsinskii Stomatologicheskii Institut, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 829-833. In Russian. refs

The effect of 25-45-min periods of emotional stress (ES) upon leukocytic reactions (LR) was evaluated in male students during the course of an academic year and an examination period. The state of ES was induced by assigning to subjects mental tasks which were to be performed in conditions of time shortage and continuous critical comments by the experimenter. The leukocyte counts and the excretion rate of total 17-ketosteroids (17-KS) were determined 2-3 min preceding the ES period, 2-3 min following its completion, and 1 hr later. The majority (39 out of 71 total) of the ES subjects exhibited one of two leukocyte reactions: a decrease in the number of leukocytes and lymphocytes (reaction of stress), or a rise of neutrophiles (reaction of adaptation). The levels of excreted 17-KS changed in the subjects with LR, but were not related to the type of LR. I.S.

A86-15520
COMPARATIVE ANALYSIS OF CORTICOSTEROID AND CATECHOLAMINE LEVELS EXCRETED IN URINE OF PERSONS WITH DIFFERENT OCCUPATIONS [SRAVNITEL'NYI ANALIZ SODERZHANIIA KORTIKOSTEROIDEV I KATEKHOLAMINOV V MOCHE U LITS S RAZLICHNOI PROFESSIONAL'NOI PODGOTOVKOI]
K. M. SMIRNOV, A. A. VIRU, and T. A. SMIRNOVA (Vsesoiuznyi Nauchno-Issledovatel'skii Institut Okhrany Truda, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 834-838. In Russian. refs

The effect of occupation (of 5 types, including intellectual activity) and work conditions on the excretion (in two 24-hr periods) of 17-oxycorticosteroids (17-OXS), adrenaline (A), and noradrenaline (NA) was studied in healthy men (aged 18-47 yrs) not engaged in athletic activities. Excretion of A and NA was found to be higher in persons whose work involved continuous responsibility and thus emotional stress (e.g., in operators of control boards) or adverse environmental conditions (cold, noise), although only NA rose above the accepted physiological norm levels. The level of 17-OXS in these groups was slightly raised. The maximal levels of the 17-OXS, A, and NA excretion occurred at different diurnal periods (morning, day, or evening), and the excretion of a particular compound could maximize differently in different groups. I.S.

A86-15522
PREDICTION OF HUMAN PHYSICAL WORK CAPACITY IN HIGH-TEMPERATURE ENVIRONMENTS [PROGNOZIROVANIE FIZICHESKOI RABOTOSPOSOBNOSTI CHELOVEKA V USLOVIIAKH VYSOKIKH TEMPERATUR VNESHNEI SREDY]
O. S. GORETSKII, V. A. MAKSIMOVICH, L. S. SHEVCHENKO, and D. IA. MIRONIUK (Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Donetsk, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 852-855. In Russian. refs

Various physiological and biochemical factors were analyzed in 200 healthy men aged 20-30 yrs before exposure to work (61 watt) in a hot environment and correlated with their ergothermic resistance (ETR), using several statistical models (Sepetliev, 1968; Gubler, 1978). The values of the erythrocyte thermal resistance, the ratio of the measured peripheral pressure to its normal value, the ratio of the measured vital lung capacity of its normal value, the vegetative index of Kerdo, the cardiac index, and the content of creatine in urine were found to be most informative in predicting ETR. Correlation analysis using combinations of these values made it possible to predict the expected ETR with 70-75 percent reliability. I.S.

A86-15523
USE OF A LINGUISTIC TEST IN THE COURSE OF LARGE-SCALE PHYSIOLOGICAL SELECTION OF MEN FOR WORK IN AN ADVERSE ENVIRONMENT [PRIMENENIE LINGVISTICHESKOGO TESTA PRI MASSOVOM FIZIOLOGICHESKOM OTBORE DLIA RABOTY V EKSTREMAL'NYKH USLOVIIAKH]
V. I. MEDVEDEV, D. L. SPIVAK, A. A. AIDARALIEV, and R. KURMANALIEVA (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Sept.-Oct. 1985, p. 861, 862. In Russian. refs

Preliminary estimates of adaptability to a high-altitude environment were obtained on the basis of a short written test, conducted by the method of Spivak (1983), on 1500 men stationed in the mountains. Such linguistic indices as the number of words used to answer the stated questions, the number of verbs used, syntagmatic associations, and changes in verbal strategy were used to assess advancing fatigue and adaptability. Relatively good adaptability was characterized by a more regularly predictable linguistic strategy. The estimates made by the linguistic test showed good correlation with the results of the physiological evaluation of adaptability. I.S.

A86-15637#
UTILIZATION OF SPACE STATIONS IN THE FIELD OF LIFE SCIENCES
M. VIEILLEFOSSE (CNES, Toulouse, France) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 9 p. refs
(IAF PAPER 85-51)

A number of French life science experiments conducted in space are presented. The influence of microgravity and the space environment on physiology, ontogeny, and phylogeny is studied. The equipment, its function, and the results of cardiovascular, neurosensoral, eye, cellular, and genetic experiments are described and diagrams are provided. The importance of a space station facility for space medicine and physiology, and the role of man on the space station is discussed. A list of necessary captors, treatment and analysis, storage, stimulation, and plant and animal facilities on a space station is presented. I.F.

A86-15822*# Miami Univ., Oxford, Ohio.
SPACE MOTION SICKNESS PREFLIGHT ADAPTATION TRAINING PRELIMINARY STUDIES WITH PROTOTYPE TRAINERS
D. E. PARKER, L. OUYANG (Miami University, Oxford, OH), J. C. ROCK, H. E. VON GIERKE (USAF, Wright-Patterson AFB, OH), M. F. RESCHKE (NASA, Johnson Space Center, Houston, TX) et al. IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 8 p. Research supported by Miami University and USAF. refs
(Contract NAS9-14538)
(IAF PAPER 85-311)

Based on the otolith tilt-translation reinterpretation hypothesis (Parker et al., 1985), preflight adaptation procedures and several preflight adaptation trainers (PATs) have been developed. Two PAT prototypes, the Miami University Seesaw (MUS) and the Dynamic Environmental Simulator (DES), include a physical room that is moved relative to the restrained subject. Results from the MUS and DES PAT experiments indicate that exposure to the produced sensory rearrangement can change eye movement reflexes. The changes persisted for a period longer than the training exposure period, indicating similarity with the eye-movement reflexes observed immediately postflight in weightlessness-adapted astronauts. It is concluded that the apparatus and procedures to preadapt astronauts to the sensory rearrangement of weightless space flight can be developed on the basis of the reported PATs and procedures. The third PAT prototype tested, which employs a computer-generated scene, failed to produce changes similar to those recorded in the MUS and DES experiments. I.S.

A86-15823*# Massachusetts Inst. of Tech., Cambridge.
SPACELAB EXPERIMENTS ON SPACE MOTION SICKNESS
C. M. OMAN (MIT, Cambridge, MA) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 17 p. refs
(Contract NCC9-1; NAS9-15343)
(IAF PAPER 85-312)

Recent research results from ground and flight experiments on motion sickness and space sickness conducted by the Man Vehicle Laboratory are reviewed. New tools developed include a mathematical model for motion sickness, a method for quantitative measurement of skin pallor and blush in ambulatory subjects, and a magnitude estimation technique for ratio scaling of nausea or discomfort. These have been used to experimentally study the time course of skin pallor and subjective symptoms in laboratory motion sickness. In prolonged sickness, subjects become hypersensitive to nauseogenic stimuli. Results of a Spacelab-1 flight experiment are described in which 4 observers documented the stimulus factors for and the symptoms/signs of space sickness. The clinical character of space sickness differs somewhat from acute laboratory motion sickness. However SL-1 findings support the view that space sickness is fundamentally a motion sickness. Symptoms were subjectively alleviated by head movement restriction, maintenance of a familiar orientation with respect to the visual environment, and wedging between or strapping onto surfaces which provided broad contact cues confirming the absence of body motion. Author

A86-15824*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
PHYSIOLOGIC ADAPTATION TO SPACE - SPACE ADAPTATION SYNDROME
J. M. VANDERPLOEG (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 4 p.
(IAF PAPER 85-313)

The adaptive changes of the neurovestibular system to microgravity, which result in space motion sickness (SMS), are studied. A list of symptoms, which range from vomiting to drowsiness, is provided. The two patterns of symptom development, rapid and gradual, and the duration of the symptoms are described. The concept of sensory conflict and rearrangements to explain SMS is being investigated. I.F.

A86-15825*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
THE HUMAN CARDIOVASCULAR SYSTEM IN THE ABSENCE OF GRAVITY
M. W. BUNGO and J. B. CHARLES (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 5 p. refs
(IAF PAPER 85-315)

The data collected from a Space Shuttle crew to investigate cardiovascular changes due to microgravity are presented. The experimental procedures which involved preflight, immediate postflight, and one week following postflight echocardiograms of 13 individuals are described. The immediate postflight results reveal a 20 percent decrease in stroke volume, a 16 percent decrease in left ventricular diastolic volume index (LVDVI), no change in systolic volume, blood pressure, or cardiac index, and a 24 percent increase in heart rate. One week later a 17 percent stroke volume increase, a 29 percent increase in cardiac index, and normal blood pressure, and LVDVI were observed. It is concluded that upon reexposure to gravity a readaptation process for the cardiovascular system occurs. I.F.

A86-15826*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
SPACELAB LIFE SCIENCES FLIGHT EXPERIMENTS - AN INTEGRATED APPROACH TO THE STUDY OF CARDIOVASCULAR DECONDITIONING AND ORTHOSTATIC HYPOTENSION
F. A. GAFFNEY (NASA, Johnson Space Center, Houston; Texas, University, Dallas) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 9 p. refs
(IAF PAPER 85-316)

A Spacelab experiment to study cardiovascular deconditioning and orthostatic hypotension is proposed. Previous experiments that have attempted to explain the factors which cause alterations in cardiovascular regulation are investigated. Based on these observations a hypothesis which states cephalad fluid shift produces cardiovascular changes is studied. The testing of the hypothesis is to include the analysis of physiological and anatomical changes in humans and animals for preflight and in-flight periods. The procedures and measurement techniques for the experiment are described. I.F.

A86-15827#
QUANTITATIVE EVALUATION OF HUMAN ARTERIAL BARORECEPTOR REFLEXES
D. L. ECKBERG, J. M. SPRENKLE, and R. L. GOBLE (USVA, Medical Center; Virginia, Medical College, Richmond) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 6 p. refs
(IAF PAPER 85-317)

A device for studying the carotid baroreceptor-cardiac reflex responses of humans subjected to microgravity is examined. The components and function of the device, which provokes sigmoid baroreceptor-cardiac reflex responses and produces R-R interval responses, are described. The relation between arterial pressure, sympathetic nerve activity, and venous plasma norepinephrine is discussed. It is concluded that changes in baroreflex functions and autonomic cardiovascular control, while in space, may alter vagal and sympathetic outflows and cause symptomatic hemodynamic changes. I.F.

A86-15828#
PULMONARY FUNCTION IN MICROGRAVITY - SPACELAB 4 AND BEYOND
H. J. GUY, G. K. PRISK, and J. B. WEST (California, University, San Diego) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 8 p. refs
(IAF PAPER 85-322)

A study to observe the influence of topographic gradients on lung function and the overall function of the lung at the onset of exposure to microgravity is proposed. The experimental procedure involves the analysis of instantaneous gas concentrations and flow at the lips as a subject switches from breathing cabin air to the inhalation and exhalation of a series of test gas mixtures. The components and functions of the gas analyzer, bag-in-box assembly, and electronic controlling assembly are described. Hypotheses concerning the observed effect of uneven ventilation, perfusion, pulmonary capillary volume and blood flow, and forced expiratory spirometry are presented. I.F.

A86-15829*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
RED BLOOD CELL DECREASES OF MICROGRAVITY
P. C. JOHNSON (NASA, Johnson Space Center, Houston, TX) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 8 p.
(IAF PAPER 85-324)

Postflight decreases in red blood cell mass (RBCM) have regularly been recorded after exposure to microgravity. These 5-25 percent decreases do not relate to the mission duration, workload, caloric intake or to the type of spacecraft used. The decrease is accompanied by normal red cell survivals, increased ferritin levels, normal radioactive iron studies, and increases in mean red blood cell volume. Comparable decreases in red blood cell mass are not found after bed rest, a commonly used simulation of the microgravity state. Inhibited bone marrow erythropoiesis has not been proven to date, although reticulocyte numbers in the peripheral circulation are decreased about 50 percent. To date, the cause of the microgravity induced decreases in RBCM is unknown. Increased splenic trapping of circulating red blood cells seem the most logical way to explain the results obtained.
Author

A86-15830*# Management and Technical Services Co., Washington, D.C.
UNDERSTANDING METABOLIC ALTERATIONS IN SPACE FLIGHT USING QUANTITATIVE MODELS - FLUID AND ENERGY BALANCE
J. I. LEONARD (GE Management and Technical Services Co., Washington, DC) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 21 p. refs
(Contract NAS9-15487; NAS9-16328; NAS9-15850; NAS9-17151)
(IAF PAPER 85-325)

The results of an integrated multidisciplinary and multiexperimental investigation, using data from the Skylab program, of metabolic adaptation to space flight are summarized and discussed. The effects of space flight on fluid-electrolyte regulation, mechanisms of hormone disturbances, energy balance, and the etiology of weight loss are emphasized. A composite picture of the fluid, electrolyte, and energy response to weightlessness, based primarily on data gathered from the nine Skylab crewmen, is presented. C.D.

A86-15832*# National Aeronautics and Space Administration, Washington, D.C.
DEVELOPMENT OF COUNTERMEASURES FOR USE IN SPACE MISSIONS
A. E. T. NICOGOSSIAN, S. POOL, C. S. L. HUNTOON, and J. I. LEONARD (NASA, Washington, DC) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 4 p. refs
(IAF PAPER 85-327)

Several measures used to mitigate the inappropriate adaptive responses of space flight are investigated. Weightlessness results in a cephalic fluid shift, which causes a reduction in the circulating blood volume, and removal of weight bearing forces from musculoskeletal systems. The physiological changes that occur from one-g initiated hypovolemia and zero-g initiated fluild shifts are analyzed and compared. The role of barorecptors on the activation of the adrenergic responses that occurs as a result of hypovolemia is studied. The proper selection and administration of in-flight and post flight countermeasures, which include passive and active physical conditioning techniques, drugs, and vitamins are examined. I.F.

A86-16051
MUSCLE METABOLISM DURING EXERCISE IN THE HEAT IN UNACCLIMATIZED AND ACCLIMATIZED HUMANS
D. S. KING, D. L. COSTILL, W. J. FINK, M. HARGREAVES, and R. A. FIELDING (Ball State University, Muncie, IN) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Nov. 1985, p. 1350-1354. Army-supported research. refs

A86-16052
THERMOREGULATORY AND BLOOD RESPONSES DURING EXERCISE AT GRADED HYPOHYDRATION LEVELS
M. N. SAWKA, A. J. YOUNG, R. P. FRANCESCONI, S. R. MUZA, and K. B. PANDOLF (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Nov. 1985, p. 1394-1401. refs

A86-16053
EFFECTS OF HEMODILUTION ON O2 TRANSPORT IN HIGH-ALTITUDE POLYCYTHEMIA
R. M. WINSLOW, C. C. MONGE, E. G. BROWN, H. G. KLEIN, F. SARNQUIST (PHS, Centers for Disease Control, Atlanta, GA; Universidad Peruana Cayetano Heredia, Lima, Peru; Mt. Sinai Medical Center, New York; National Institute of Health, Bethesda, MD; Stanford University, CA) et al. Journal of Applied Physiology (ISSN 0161-7567). vol. 59, Nov. 1985, p. 1495-1502. refs
(Contract NSF INT-77-21795; NSF INT-80-07728)

A native of the Peruvian Andes (4,250 m) was studied before and after isovolemic hemodilution of the hematocrit from 62 to 42 percent. O2 transport was studied with newly developed catheters in the radial and pulmonary arteries. These catheters allowed continuous measurement of arteriovenous O2 content and intermittent cardiac output by thermodilution. During exercise tests, breath-by-breath gas exchange measurements also allowed cardiac output to be calculated by the O2-Fick technique. A complex series of interrelated physiological changes occurred in response to hemodilution. These included increased ventilation, increased arterial and mixed venous PO2, increased cardiac output (both heart rate and stroke volume), and improved ventilation-flow match. The general improvement in symptoms that followed hemodilution correlated well with increased anaerobic threshold and mixed venous PO2 during exercise. Author

N86-12377# Tokyo Denki Univ. (Japan). Faculty of Engineering.
EFFECTS OF CATION IONS IN NERVE EXCITATION
K. AIHARA, M. KOTANI, and T. UTSUNOMIYA *In its* Res. Rept. of the Faculty of Eng., Tokyo Denki Univ., No. 32 p 67-78 Dec. 1984 refs In JAPANESE; ENGLISH summary
Avail: NTIS HC A09/MF A01

A bifurcation process of the self-sustained oscillation state of action potentials as a dissipative structure in squid giant axons is theoretically analyzed in relation to a nonequilibrium property inherent to biological membranes. A bifurcation diagram is numerically calculated by the use of the modified Hodgkin-Huxley equations which are derived by considering both an adaptation effect of axons and an effect of divalent cations upon membrane conductance. Further, the result is confirmed by the Hopf bifurcation theory. These analyses clarify the relations between the Hopf bifurcation of the dissipative structure with the limit cycle in squid giant axons and the nonequilibrium property of the ionic concentration differences across the membrane. Author

N86-12458# Joint Publications Research Service, Arlington, Va.
HUMAN HEMODYNAMIC CHANGE UNDER HIGH ATMOSPHERIC PRESSURE
Z. HENGDU and D. DUANYANG *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-030) p 55-56 4 Sep. 1985 Transl. into ENGLISH from Jiefangjun Yixue Zazhi (Beijing), no. 1, 20 Feb. 1985 p 63
Avail: NTIS HC A08/MF A01

For the purpose of observing human hemodynamic change under high atmospheric pressure, nontraumatic means were adopted to record sphygmograms during a 26 day continuous nitrogen-oxygen saturation dive simulation trial 36.5 m. The test subjects assumed a supine position and the sphygmogram was recorded on closed vessels on the left side using a mercurial sphygmomanometer to measure blood pressure in the arteria brachialis of the left arm. The data from the initial measurements was processed through electronic computer. The voluntary test subjects were seven young males averaging 22.6 + or - 3.9 years of age. The simulated pressure measured 4.65 ATA, cabin temperature was 26.05 + or - 0.8 deg C and relative humidity measured 70.3 + or - 0.9 percent. Differential pressure measured 0.31 + or - 0.08 ATA for oxygen, 0.002 ATA for carbon dioxide and 4.34 ATA for nitrogen. The subjects lived and worked under the above conditions for 26 continuous days and nights and underwent 4 days of decompression to return to normal pressure. The results of these tests are briefly decribed. Author

N86-12954* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY CONTINUING BIBLIOGRAPH: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Oct. 1985 64 p
(NASA-SP-7011(276); NAS 1.21:7011(276)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in September 1985. F.M.R.

N86-12955 Department of the Navy, Washington, D. C.
INFRARED OPTICAL MEASUREMENT OF BLOOD GAS CONCENTRATIONS AND FIBER OPTIC CATHETER Patent
T. J. MANUCCIA and J. G. EDEN, inventors (to Navy) 9 Apr. 1985 7 p
(AD-D011836; US-PATENT-4,509,522;
US-PATENT-APPL-SN-331091; US-PATENT-CLASS-128-634)
Avail: US Patent and Trademark Office CSCL 06L

This patent pertains to a simple compact optical device and method for quickly measuring the concentration of CO and CO2, bound to hemoglobin or dissolved in a person's blood using optical techniques which do not require removing a blood sample from the body. It also provides a simple fiber optic device for measuring blood-gas concentrations of critical internal points of the circulatory system such as the aorta. GRA

N86-12956*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PLASMA VOLUME METHODOLOGY: EVANS BLUE, HEMOGLOBIN-HEMATOCRIT, AND MASS DENSITY TRANSFORMATIONS
J. E. GREENLEAF and H. HINGHOFER-SZALKAY Nov. 1985 25 p refs
(NASA-TM-86834; REPT-85406; NAS 1.15:86834) Avail: NTIS HC A02/MF A01 CSCL 06P

Methods for measuring absolute levels and changes in plasma volume are presented along with derivations of pertinent equations. Reduction in variability of the Evans blue dye dilution technique using chromatographic column purification suggests that the day-to-day variability in the plasma volume in humans is less than + or - 20 m1. Mass density determination using the mechanical-oscillator technique provides a method for measuring vascular fluid shifts continuously for assessing the density of the filtrate, and for quantifying movements of protein across microvascular walls. Equations for the calculation of volume and density of shifted fluid are presented. E.A.K.

N86-12957# Department of the Army, Washington, D. C.
FORWARD FIELD AUTOTRANSFUSION DEVICE Patent Application
E. I. SCHWEITZER and K. G. SWAN, inventors (to Army) 10 May 1985 12 p
(AD-D011763; US-PATENT-APPL-SN-732335) Avail: NTIS HC A02/MF A01 CSCL 06L

A typical embodiment of the invention enables blood to be drawn from the pleural cavity of an injured patient for autotransfusion purposes. A chest tube is connected to an inlet check valve within a resilient bulb suction pump. Blood, drawn into the bulb, is expelled therefrom by manipulating the bulb to cause the blood to flow out of the bulb through a filter and a discharge check valve to a blood collection bag. GRA

N86-12958# Department of the Army, Washington, D. C.
SUTURE NEEDLE HOLDER Patent Application
E. J. SCHWEITZER and J. R. BRESCH, inventors (to Army) 3 Jun. 1985 15 p
(AD-D011764; US-PATENT-APPL-SN-740610) Avail: NTIS HC A02/MF A01 CSCL 06L

A typical embodiment on the invention enables a surgeon to occupy only one hand in manipulating a suture needle. The instrument thumb handle has, on one end, a freely rotatable short

roller. The ring finger handle, moveover, has a long roller that is journalled within that handle. One end of the long roller bears against the short roller to form a nip that engages the suture needle. The other end of the long roller terminates near the ring finger handle grip to enable the surgeon to rotate the long roller with another finger of the same hand and thereby draw the needle through the nip, repositioning the needle for another stitch. GRA

N86-12959# School of Aerospace Medicine, Brooks AFB, Tex.
PROCEEDINGS OF A WORKSHOP ON RADIOFREQUENCY RADIATION BIOEFFECTS HELD AT WACHTBERG-WERTHHOVEN, WEST GERMANY ON 11-13 SEPTEMBER 1984 Final Report
J. C. MITCHELL Apr. 1985 241 p Presented at Workshop held at Wachtberg-Werthhoven, West Germany, 11-13 Sep. 1984
(Contract AF PROJ. 7757)
(AD-A157090; USAFSAM-TP-85-14) Avail: NTIS HC A11/MF A01 CSCL 06R

The workshop was convened to address new developments in the setting and application of RFR (Radiofrequency Radiation) safety standards, assessment of RFR levels in the military environment, RFR instrumentation and dosimetry, the medical approach to specific problems, and important state-of-the-art research regarding the biological effects of long-term low-level RFR exposures, pulsed versus continuous wave effects, and the effects of unique pulse modulation. The collected papers represent the contributions of various experts in the field from the NATO countries, brought together under the the sponsorship of Defense Research Group, Panel 8, NATO AS/243, at the Research Establishment for Applied Science, D-5307 Wachtberg-Werthhoven, Federal Republic of Germany. GRA

N86-12960# Letterman Army Inst. of Research, San Francisco, Calif.
ENERGY EXPENDITURE AND ACTIVITY PATTERNS OF CADETS AT THE UNITED STATES MILITARY ACADEMY, WEST POINT, NEW YORK Final Report, for Period Ending Oct. 1979
M. J. KRETSCH, M. O. OCONNOR, and H. E. SAUBERLICH Jun. 1985 42 p
(AD-A157857; LAIR-IR-200) Avail: NTIS HC A03/MF A01 CSCL 06P

A study was conducted in October, 1979, at the United States Military Academy, West Point, New York, to evaluate factors contributing to weight gain in cadets over the course of their academic career. This report presents the average daily energy expenditure (EE) and activity patterns of male and female cadets. A total of 136 male and 54 female cadets from the classes of 1980, 1981, 1982, and 1983 were studied. Five consecutive days (Wednesday through Sunday) of activity data were collected from each study participant by the factorial method. The average pattern of EE usage was similar between male and female cadets: about 20% at rest; 35 to 40% in very light activities; 5 to 10% in light activities; about 25% in moderate activities; and the remaining 5 to 15% in heavy or very heavy activities. Average energy expenditure when expressed as kcal/kg body weight was not significantly different between male and female cadets of the same class for weekdays or weekend days. There was a tendency for the cadets to become more sedentary with advance in class. This was more noticeable for the females than for the males. There was a significant decrease in weekday, but not weekend day, EE for the females with advance in class. This same decrease was not significant for the male cadets, but there was a weekday trend in that direction. For the females, the lower weekday EE for the 1980 and 1981 classes may be explained by the lower amount of energy and time spent in running and sports activities. Whether the decrease in weekday EE with advance in class is due to differences in program requirements should be examined. GRA

N86-12961# Brown Univ., Providence, R. I. Center for Neural Science.
CORTICAL PLASTICITY: THEORETICAL ANALYSIS, EXPERIMENTAL RESULTS
L. N. COOPER 31 Jul. 1985 34 p
(Contract N00014-81-K-0136)
(AD-A157965; TR-27) Avail: NTIS HC A03/MF A01 CSCL 06O

An account is given of a theory of and experimental results on development and modification of selectivity and ocular dominance in visual cortex. The single cell theory is generalized to be applicable to a neural network. Also discussed, in the context of the theoretical ideas, are experiments on the modifiability of inhibitory cells and on possible candidates for global controllers of learning. GRA

N86-12962# Department of the Army, Washington, D. C.
DERMAL SUBSTANCE COLLECTION DEVICE Patent Application
C. C. PECK, inventor (to Army) 11 Feb. 1985 29 p
(AD-D011848; US-PATENT-APPL-SN-660778) Avail: NTIS HC A03/MF A01 CSCL 14B

This patent application describes a dermal substance collection device (DSCD) which provides means for the non-invasive, instantaneous and continuous monitoring of chemical substances which are present in a detectable amount in either or both interstitial fluid or sweat or which are on or in the skin. The transdermal substance collection device of this invention is comprised of three essential components: (1) a substance binding reservoir, wettable by, (2) a liquid transfer medium which allows for liquid bridge transfer of a soluble substance from the skin surface to the binding reservoir by virtue of its wettability by the liquid, and (3) an occlusive cover. GRA

N86-12963# School of Aerospace Medicine, Brooks AFB, Tex.
THE EFFECTS OF HYPOXIA INDUCED BY LOW ATMOSPHERIC PRESSURE ON SOFT CONTACT LENS WEAR Final Report, 1 Jun. 1983 - 1 Jan. 1985
W. J. FLYNN, R. E. MILLER, II, M. G. BLOCK, and T. J. TREDICI Jun. 1985 16 p
(Contract AF PROJ. 2729)
(AD-A158556; USAFSAM-TR-85-30) Avail: NTIS HC A02/MF A01 CSCL 06L

Contact lens use in aviation has long been a subject of debate and controversy. One of the major concerns for contact lens wear at altitude is the potential for corneal edema and subsequent visual degradation, due to the reduced levels of oxygen available for normal corneal metabolism. Four subjects were tested, wearing both high-and low-water content soft contact lenses, for visual changes and adverse corneal physiological responses due to hypoxia induced by an atmospheric pressure level equivalent to 10,000 ft. Results of this study indicate that, although the cornea is placed under higher levels of physiological stress at an altitude of 10,000 ft, the absence of visual degradation or significant symptoms suggests that lenses can be safely worn under the conditions of this study. Author (GRA)

N86-12964# National Academy of Sciences - National Research Council, Washington, D. C.
STUDIES OF PARTICIPANTS IN NUCLEAR TESTS Final Report, 1 Sep. 1978 - 31 Oct. 1984
C. D. ROBINETTE, S. JABLON, and T. L. PRESTON May 1985 102 p refs
(Contract DE85-AI08-78EV-01577)
Avail: NTIS HC A06/MF A01

Mortality, by cause of death, was studied on a cohort of 46,186 participants in one or more of five test series. The series studied were UPSHOT-KNOTHOLE (1953) and PLUMBBOB (1957) at the Nevada Test Site, and GREENHOUSE (1951), CASTLE (1954), and REDWING (1956) which were conducted at the Pacific Proving Ground at Enewetak and Bikini. The number of deaths attributed to particular causes was compared with the number expected to occur at US cause and age-specific mortality rates. A total of

5113 deaths from all causes was ascertained; this was 11.1% of the number of participants. The number was, however, only 83.5% of the number expected at US mortality rates. Mortality from leukemia among the 3554 participants at SMOKY - 10 deaths below age 85 - were 2.5 times the expected number. When the leukemia deaths are compared to other deaths in all six data sets, the differences among the series are not significant. No cancer other than leukemia was ascertained to have occurred in significant excess among SMOKY participants and the number of deaths from other cancers (67) was less than the number expected at population rates (83.8). The total body of evidence cannot convincingly affirm or deny that the higher than statistically expected incidence of leukemia among SMOKY participants (or of prostate cancer among REDWING participants) is the result of radiation exposure incident to the tests. DOE

N86-12965# Pacific Northwest Lab., Richland, Wash.
ACCIDENTAL EXPOSURE TO AMERICIUM
K. R. HEID Apr. 1985 13 p refs Presented at the Health Phys. Summer School Conf., Evanston, Ill., 3 Jun. 1985
(Contract DE-AC06-76RL-01830)
(DE85-012794; PNL-SA-13155; CONF-8506136-1) Avail: NTIS HC A02/MF A01

An accident in which a 64 year old Hanford nuclear worker was exposed to high levels of americium while working in an americium recovery facility in 1976 is described. As a result of the accident, he was heavily externally contaminated with americium, sustained with a substantial internal deposition of this isotope, and was burned with concentrated nitric acid and injured by flying debris about the face and neck. The immediate and longer term treatment given the patient, including the decontamination efforts and clinical laboratory studies, are discussed. Special in vivo equipment and techniques were used to measure the americium deposited in the patient. These and subsequent in vivo measurements were used to estimate the dose rates and the accumulated doses to body organs. Urinary and fecal excreta were collected and analyzed for americium content. The interpretation of these data was complicated by the fact that the intake resulted both from inhalation and from solubilization of the americium embedded in facial tissues as a result of the accident. A total of 1100 (MU)Ci was excreted in urine and feces during the first 2 years following the accident. The long term use of diethylenetriaminepentaacetic acid (DTPA), used principally as the zinc salt, is discussed including the method, route of administration, and effectiveness. To date, the patient has apparently experienced no complications attributable to this extensive course of therapy, even though he was given approximately 560 g of DTPA. DOE

N86-12966# Joint Publications Research Service, Arlington, Va.
CHINA REPORT: SCIENCE AND TECHNOLOGY
18 Jun. 1985 117 p refs Transl. into ENGLISH from various Chinese articles
(JPRS-CST-85-019) Avail: NTIS HC A06/MF A01

Progress in science and technology in the People's Republic of China is reported. Topics discussed include: national developments, life sciences, biochemistry, biology, cement industry, chemistry, computers, engineering, industrial hygiene, medical science, microbiology, pharmacology, radiology, semiconductor materials, and telecommunications.

N86-12967# Joint Publications Research Service, Arlington, Va.
PROTECTION OF EYES AGAINST LASER DAMAGE STUDIED
G. CHONGWEN, W. RONGZHEN, and J. HUMEI *In its* China Rept.: Sci. and Technol. (JPRS-CST-85-019) p 41-48 18 Jun. 1985 refs Transl. into ENGLISH from Zhongguo Jiguang (Shanghai), no. 2, 20 Feb. 1985 p 113-117
Avail: NTIS HC A06/MF A01

The potential hazards of lasers were analyzed in eye injuries caused by lasers. Hygienic physical experiments were performed on reflected laser light from hitting spots which caused most eye injuries. Measures for the protection of eyes against laser damage are discussed. E.A.K.

N86-13886*# National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
ENDOCRINE AND FLUID METABOLISM IN MALES AND FEMALES OF DIFFERENT AGES AFTER BEDREST, ACCELERATION AND LOWER BODY NEGATIVE PRESSURE
C. S. LEACH, J. VERNIKOS-DANELLIS (NASA. Ames Research Center), J. M. KRAUHS (Northrop Services, Inc., Houston, Tex.), and H. SANDLER (NASA. Ames Research Center) Nov. 1985 52 p refs
(NASA-TM-58270; S-550; NAS 1.15:58270) Avail: NTIS HC A04/MF A01 CSCL 06S

Space shuttle flight simulations were conducted to determine the effects of weightlessness, lower body negative pressure (LBNP), and acceleration of fluid and electrolyte excretion and the hormones that control it. Measurements were made on male and female subjects of different ages before and after bedrest. After admission to a controlled environment, groups of 6 to 14 subjects in the age ranges 25 to 35, 35 to 45, 45 to 55 to 65 years were exposed to +3 G sub z for 15 minutes (G1) and to LBNP (LBNP1) on different days. On 3 days during this prebedrest period, no tests were conducted. Six days of bedrest followed, and the G sub z (G2) and LBNP (LBNP2) tests were run again. Hormones, electrolytes, and other parameters were measured in 24-hour urine pools throughout the experiment. During bedrest, cortisol and aldosterone excretion increased. Urine volume decreased, and specific gravity and osmolality increased. Urinary electrolytes were statistically unchanged from levels during the non-stress control period. During G2, cortisol increased significantly over its control and bedrest levels. Urine volume, sodium, and chloride were significantly lower; specific gravity and osmolality were higher during the control period or bedrest. The retention of fluids and electrolytes after +G sub z may at least partially explain decreased urine volume and increased osmolality observed during bedrest in this study. There were some who indicated that space flight would not affect the fluid and electrolyte metabolism of females or older males any more severely than it has affected that of male astronauts. Author

N86-13887# Army Research Inst. of Environmental Medicine, Natick, Mass.
THE EFFECT OF SPIRONOLACTONE ON THE CARDIOCIRCULATORY RESPONSES TO UPRIGHT TILT AT SEA LEVEL AND AT SIMULATED HIGH ALTITUDE
C. S. FULCO, R. LARSEN, P. B. ROCK, A. J. YOUNG, and A. CYMERMAN 19 Jun. 1985 18 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A157734; USARIEM-M33/85) Avail: NTIS HC A02/MF A01 CSCL 06O

The objective of this study was to determine if spironolactone (S) alters the cardiocirculatory responses to upright tilt at sea level (SL;50m) and during 44 hours of simulated altitude (HA;4600m). In a double-blind, crossover-designed study, 9 male subjects (age range: 18 to 25 years) received 25 mg orally, 4x/day of either S or an identically-appearing placebo (P) 2 days prior to and during HA. The crossover was separated by two weeks. Heart rate, stroke volume, cardiac output, calf blood flow, total peripheral resistance and system blood pressure were obtained during supine rest and after 10 minutes of 60 degree head-up tilt using an impedance monitor and an electro-sphygmomanometer. Twenty-four hour determinations of urinary volume, sodium and potassium, as well as venous plasma values for sodium, potassium and chloride were obtained daily. There were no statistically significant differences between P and S treatment periods for: caloric, electrolytes; of fluid ingestion; urinary volume or electrolytes; plasma electrolytes; or any of the cardiocirculatory parameters measured in the supine or upright position at SL or during HA. It was concluded that S did not induce a significant diuresis or significantly alter vascular responsiveness to negatively effect the normal cardiocirculatory responses to upright tilt at sea level or simulated high altitude. GRA

N86-13888# School of Aerospace Medicine, Brooks AFB, Tex.
INTERACTIVE SCENARIO COMPUTER MODEL FOR DOSE RATES TO AIRCREWS IN FLIGHT THROUGH NUCLEAR DEBRIS CLOUDS Final Report, Dec. 1981 - Oct. 1984
J. TABOADA, D. HEGEDUSICH, and E. L. BELL Jul. 1985 18 p
(AD-A158741; USAFSAM-TR-85-49) Avail: NTIS HC A02/MF A01 CSCL 06R

An interactive computer model is described for the rapid calculation of gamma radiation doses to aircrews in hypothetical flights through nuclear debris clouds. The model is based on CASSANDRA, a U.S. army developed code for dust concentration calculations at loci through such a cloud. The present model computes local radiation dose integrals along a user-specified flight path. It is designed for efficient interactive operation on a Digital Equipment Corporation Model VAX 11/780 computer. GRA

N86-13889# Northwestern Univ., Evanston, Ill.
ENHANCING SENSITIVITY TO VISUAL MOTION AND ENHANCING VISUAL SENSITIVITY Interim Report, 1 Oct. 1981 - 30 Sep. 1983
R. SEKULER 4 Jun. 1985 28 p
(Contract AF-AFOSR-0246-80)
(AD-A158800; AFOSR-85-0668TR) Avail: NTIS HC A03/MF A01 CSCL 06P

This report describes progress made from October 1, 1981 to September 30, 1983. During this period work proceeded on three main lines of study: (1) various aspects of visual motion perception, (2) collaborative work on contrast sensitivity and pilots' performance in aircraft simulators, and 3) individual differences in responses to temporal transients. The most extensive of the three work-units dealt with motion perception by human observers. The main findings include the following: (1) Perceived speed of a moving target varies with that target's contrast and retinal eccentricity. In particular, many targets undergo illusory slowing when they appear in the periphery in the visual field, (2) detection of a moving target is often dissociated from the ability to identify the direction in which the target moves. In particular, the accuracy with which target direction can be judged, even for highly visible targets, seems to far less good than previously suspected, (3) relatively small amounts of training can significantly improve an observer's ability to discriminate between two highly similar directions of target motion. Moreover, this effect is well-restricted to the training direction and other, similar directions; the training effect is retained without decrement for at least two months. The results suggest that this improvement with training represents a genuine change in visual function. GRA

N86-13890# Air Force Human Resources Lab., Brooks AFB, Tex.
PILOT-ORIENTED PERFORMANCE MEASUREMENT Final Report, Jan. - Dec. 1983
J. DEMAIO, H. H. BELL, and J. BRUNDERMAN Aug. 1985 15 p
(Contract AF PROJ. 2313)
(AD-A158849; AFHRL-TP-85-18) Avail: NTIS HC A02/MF A01 CSCL 14B

Aircrew performance measurement is a critical problem in evaluating the quality of a visual simulation system and in determining the effectiveness of aircrew training devices. An effective performance measurement system must be able to separate performance into appropriate components and describe the relationship of these components. This paper describes a performance measurement system developed to analyze pilot performance in maintaining altitude in both straight and turning flight as a function of the object density of the simulated visual environment. The analysis indicates that pilot performance can be divided into perceptual and task difficulty factors and that the effect of the visual environment on each of these factors can be determined. A prototype performance measurement system was developed to describe pilot performance in a simulator. The pilot's task was to maintain altitude at 200 feet both in straight and in turning flight. Pilot performance was sensitive to task difficulty and to visual scene quality. The strength of this performance measurement system was that it analyzed performance in terms of overall task performance and also specific pilot control inputs. GRA

N86-13891# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
HEALTH HAZARD EVALUATION OF LIQUID MONOPROPELLANTS. PHASE 5: COMPARATIVE INHALATION TOXICITIES OF LGP 1776, LGP 1845, AND HAN (HYDROXYLAMMONIUM NITRATE) Final Report
H. L. SNODGRASS, JR. Jun. 1985 33 p
(AD-A159090; USAEHA-75-51-0132-85) Avail: NTIS HC A03/MF A01 CSCL 06T

A comparison of the inhalation toxicities of two liquid gun propellant (LGP) formulations, LGPs 1776 and 1845, was made using rats. Also assessed was the major chemical component of each, hydroxylammonium nitrate (HAN). Rats exposed to saturated vapors of the two LGPs for 8 hours were uneffected. Following single acute aerosol exposures, LGP 1845 was more toxic, with deaths occurring at concentrations of 1350 to 1603 mg/cu m. After 5 or 10 daily aerosol exposures to the three formulations, comparable dose-dependent effects were noted. These included hematological, organ-to-body weight ratio, and pathological changes, generally at the highest exposure level of 600 mg/cu m. It is concluded that acute exposures to LGP vapors should not be hazardous to man. Also inferred is that the effects of repeated, sublethal exposures to LGPs 1776 and 1845 are quantitatively similar to those observed with HAN, the major chemical component. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-13569
MOURNING AND TRAUMATIC NEUROSES - CLINICAL ASPECTS AND AERONAUTICAL INCIDENTS FOR ONE HELICOPTER PILOT [DEUIL ET NEVROSE TRAUMATIQUE - ASPECTS CLINIQUES ET INCIDENCES AERONAUTIQUES CHEZ UN PILOTE D'HELICOPTERE]
J. C. DUBOUIS-BONNEFOND (Armee de l'Air, Centre Medical de Psychologie Clinique, Paris, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 155-158. In French. refs

The case history of the onset, progression, diagnosis and analysis of the traumatic neuroses which rendered a military helicopter pilot unable to continue flying are summarized in terms of general principles. The trauma was initiated by the deaths of several other pilots in the same squadron due to air accidents. The pilot eventually could not handle his own aircraft, had continuous nightmares about death and helicopters, and began expressing guilt for his friends' deaths. He became aggressive toward superiors and was relieved of flight duty, after which the anguish-driven behavior patterns diminished, followed by depression. The application of a number of personality profile tests supported previous speculation that a pilot's professional attitude and ignorance of death actually suppresses a continuous awareness of death. Life events, on or off duty, which expose the pilot to the reality of death remove the psychic barriers to the continuous perception of terminal hazards faced by pilots. The pilot may then need to be retrained for some other task. M.S.K.

A86-13943#
PSYCHOLOGICAL STATES OF STUDENT PILOTS IN FLIGHT TRAINING
M. OKAUE and Z. TAKASHIMA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, June 1985, p. 67-79. In Japanese, with abstract in English. refs

Questionnaire responses from 83 Japanese flight students were analyzed in order to evaluate the psychological state of the inexperienced pilot in flight. The distribution of flight experience in the class was: 33 primary level students; 26 students in the middle grades; and 24 advanced students. The effect of classroom performance on the prevalence of anxiety among the students is discussed. Attention is given to some of the psychological pressures contributing to pilot errors, including missed approaches; spin; and off runway landings. I.H.

A86-13944#
CHANGES OF FLYING SKILLS DURING NON-FLIGHT PERIODS
Z. KATOH, A. KADOO, Y. NAGASAWA, T. OBATA, and N. IGUCHI Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, June 1985, p. 81-104. In Japanese, with abstract in English. refs

Flight data from 28 training pilots were analyzed with respect to changes in flying skill during non-flight periods. On board flight data recordings and questionnaries concerning the self-estimation of pilot skill were evaluated with respect to three maneuvers: vertical S-Alpha (VSA); a steep turn (STP); and a horizontal turn (HRZ). A brief summary of the results is provided. I.H.

A86-14143
THE PERCEPTION OF MOTION DURING COLINEAR EYE MOVEMENTS
H. WALLACH, D. NITZBERG (Swarthmore College, PA), and R. BECKLEN (Sarah Lawrence College, Bronxville, NY) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 1, July 1985, p. 18-22. refs
(Contract NSF BNS-83-18772)

When the eyes are engaged in pursuit movements, the image of a stationary object shifts on the retina, but such a target is either perceived as stationary or seems to move only little. This is the result of a compensation process called position constancy, which takes the eye movements into account. Becklen, Wallach, and Nitzberg (1984) reported that position constancy does not operate when the target undergoes a motion of its own, in a direction that differs from the direction of the eye movements. Other findings have indicated that position constancy has an effect when the target motion is colinear with the eye movements, but the accuracy with which it then operates has not been known. How correctly motions that were colinear with eye movements were perceived is measured and it is found that the extents of target motions were accurately perceived when they were in the same direction as the eye movement, but that position constancy showed a small, but distinct, lag when eye-movement and target motions were in opposite directions. Author

A86-14321
PHYSIOLOGICAL REFLECTIONS OF MENTAL WORKLOAD
P. A. HANCOCK, N. MESHKATI, and M. M. ROBERTSON (Southern California, University, Los Angeles) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1110-1114. refs

Results of studies of the effect of mental workload on the major physiological responses (e.g., the auditory canal temperature, ACT; galvanic skin response, GSR; electrocardiogram, ECG; heart rate variability, HRV; event-related potentials, ERP; flicker and critical fusion frequencies, FFs; muscle tension, MT; respiration, R; body fluid responses, BF; etc.) are presented. The differing physiological measures were plotted in a two-dimensional space, the x-axis of which represented relevance to actual central nervous system (CNS) activity, while the y-axis, the measure, low or high of practical application (P). The measurements of HRV and ACT were the most practical parameters, whereas the ERP are rated as the most superior indices of CNS activity. ECG, GSR and FF rated lowest on the CNS axis. ACT is discussed as a potential optimal composite measure. I.S.

A86-14575#
A STUDY OF THE PSYCHOPHYSICAL MEASUREMENT ON FLUCTUATING SOUND BY A STOCHASTIC APPROXIMATION METHOD
H. KADO Electrotechnical Laboratory, Researches (ISSN 0366-9106), no. 852, March 1985, 80 p. In Japanese, with abstract in English. refs

The loudness and perceived rate of fluctuating sound are studied. The psychophysical measurement of fluctuating sound is discussed, and an adaptive psychophysical measurement method is developed and evaluated theoretically. This method consists of an adaptive searching method applying stochastic approximation to obtain the response to the presented stimuli using a step-by-step procedure, and a numerical searching method in nonlinear problems to estimate unknown parameters numerically. The loudness of Gaussian fluctuating sound is measured, and the perceived rate of the fluctuating envelope is determined. The correlation of the fluctuating sound value to psychological effects is addressed. The results can be used to construct a loudness meter. C.D.

A86-15524
THE EFFECT OF HIGH SPATIAL FREQUENCIES ON VISUAL RECOGNITION PROCESSES [VLIIANIE VYSOKIKH PROSTRANSTVENNYKH CHASTOT NA PROTSESSY ZRITEL'NOGO RASPOZNAVANIIA]
E. D. BORISOVA and O. P. TAIROV (Leningradskii Gosudarstvennyi Universitet, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Sept. 1985, p. 1067-1071. In Russian. refs

The effect of optical filtering (OF) of the high-frequency component from the spatial-frequency spectra of numerical images on the probability of recognition was studied in healthy right-handed subjects. Exposition time was varied from 20 msec to 1000 msec, and recordings were made of the correctness of answers, the latency of the answer periods, and the changes in the time-amplitude characteristics of the visual evoked potential (EP) in the occipital 01 and 02 area leads. Defocussing of the images by OF led to a decrease in recognition probability and in the amplitudes of negative (N1) and positive (P2) waves of the late phases of EPs. As the extreme spatial frequency of the image increased, the spike latencies of the N1 wave increased, and those of the P2 wave decreased. It is suggested that the N1 wave reflects the activation of selectively set spatial frequency filters of the visual sensory system, while the P2 wave reflects decision-making processes in recognition. I.S.

A86-15831#
THE VISUAL STRESS MODEL - A PSYCHO-PHYSIOLOGICAL METHOD FOR THE EVALUATION OF OPERATIONAL RELIABILITY OF PILOTS AND COSMONAUTS
H. HAASE and H. KAMMEL (Gesellschaft fuer Weltraumforschung und Raumfahrt, Berlin, East Germany) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 23 p.
(IAF PAPER 85-326)

A psychophysiological investigative method for evaluating visual-cognitive performance preconditions and operational reliability is presented. The method applies reafferent stress which expresses typical aspects of information processing in the cockpit. Changes in operational, psychological, and physiological parameters before, during, and after the test stress are recorded simultaneously. Psychological question blanks before and after the test are used to record stress-implicated changes in the state of subjective feelings. The test results are useful for the dynamic evaluation of operational performance, the physiological reaction profile, the dimensions of the experienced stress, and the efficiency of coping with test requirements. C.D.

N86-12968# Air Command and Staff Coll., Maxwell AFB, Ala.
THE HELICOPTER TO FIXED WING CONVERSION PROGRAM: A CRITICAL REVIEW
L. T. MASSEY Apr. 1985 39 p
(AD-A156820; ACSC-85-1750) Avail: NTIS HC A03/MF A01 CSCL 05I

USAF helicopter pilots are initially trained by the U.S. Army through their undergraduate helicopter pilot training program. Four to seven years later, some of these pilots have the opportunity to convert to fixed wing aircraft via the fixed wing conversion program currently conducted by sending selected helicopter pilots through Air Force undergraduate pilot training. This study reviews these programs and assesses the impact this training philosophy has on career opportunities for helicopter pilots, both for those who convert to fixed wing systems, as well as for those who remain in helicopters. Two alternatives are presented which would resolve the problems identified. The study concludes that the USAF could provide better career opportunities for helicopter pilots, as well as improve experience levels in the helicopter force, by enacting changes to current training programs. Author (GRA)

N86-12969# Chicago Univ., Ill. Graduate School of Business.
STIMULUS STRUCTURES AND MENTAL REPRESENTATIONS IN EXPERT COMPREHENSION OF COMPUTER PROGRAMS Technical Report, Sep. 1982 - Jan. 1985
N. PENNINGTON Jan. 1985 110 p
(Contract N00014-82-K-0759)
(AD-A157520; TR-2-ONR) Avail: NTIS HC A06/MF A01 CSCL 05J

The difficulty of computer programming and other design tasks is a function of the multiple abstractions that combine to form a program's meaning. Thus, comprehension of the final form of a program design, the program text, involves retrieving multiple sets of relationships between parts. The research presented here addresses which, if any, abstraction is dominant psychologically in programmers' mental representation of programs, specifically whether procedural (control flow) or functional (goal hierarchy) abstractions dominate, and the relative ease or difficulty of inferring different kinds of information from the text. Eighty professional programmers were tested on comprehension and recognition of short program texts. The results, which suggest that procedural rather than functional units form the basis of expert programmers' mental representations, support work in other areas of test comprehension showing the importance of test structure knowledge in understanding. The results also raise questions concerning claims that chunking found in comprehension and memory tasks in skilled problem solving domains is due to pattern matching to schematic content knowledge rather than to knowledge of more abstract text or design structure units. GRA

N86-12970# California Univ., San Diego, La Jolla. Inst. for Cognitive Science.
HUMAN COGNITION AND PERFORMANCE Final Report, Apr. 1979 - Mar. 1985
D. A. NORMAN, D. E. RUMELHART, and D. R. GENTNER 1 May 1985 101 p
(Contract N00014-79-C-0323)
(AD-A157665) Avail: NTIS HC A06/MF A01 CSCL 05J

The Cognitive Science Laboratory is a part of both the Institute for Cognitive Science and the Center for Human Information Processing at their University of California, San Diego. Work in the laboratory is aimed at developing a deeper understanding of the theory and applications of human information processing. The research aims of the laboratory are broad, but all the work follows a common theoretical view of cognition, providing a cohesion that binds the separate studies together, despite the apparent wide differences in content. All of the work can be characterized as being Studies of Human Cognition. This is the main focus of the laboratory's efforts, and over the years the work has covered in-depth problems within the areas of preception, attention, learning, memory, language, thought, and action. Special emphasis has been placed on knowledge representation, and one major contribution of the laboratory has been within the area: The representational structure known as Active Structural Networks. Work in this general area is always in process elaborated and modulated by the results and progress of work in the speciality areas. Three specialty areas can be talked about separately. GRA

N86-12971# Navy Personnel Research and Development Center, San Diego, Calif.
A NEW HAZARD FUNCTION ESTIMATOR OF PERFORMANCE TIME Technical Report, Oct. 1983 - Jul. 1984
B. BLOXOM Nov. 1984 35 p
(AD-A157843; NPRDC-TR-85-10) Avail: NTIS HC A03/MF A01 CSCL 05J

The analysis of performance time is used to study a wide variety of manpower, training, and human factors problems in the Navy. The cumulative distribution of performance time provides some indication of the rate of performance, but it can lead to false conclusions as well. One method of measuring the rate of performance with a shifting residual basis of analysis, called hazard analysis, consists of estimating a hazard function, which shows the rate of performance as a function of time. Although various procedures have been developed for estimating a hazard function, none of the procedures has been shown to produce plausibly smooth and precise estimates under a variety of conditions. This research proposed a constrained quadratic spline as an estimator or the hazard function of performance time. A maximum penalized likelihood procedure was used to fit the estimator to a sample of psychological response times. The procedure was also used in a simulation study of the precision of the estimator. GRA

N86-12972# Illinois Univ., Urbana. Computer-based Education Research Lab.
DIAGNOSING COGNITIVE ERRORS: STATISTICAL PATTERN CLASSIFICATION AND RECOGNITION APPROACH
K. K. TATSUOKA Jan. 1985 36 p
(Contract N00014-82-K-0604; RR0-4204)
(AD-A158108; IU-CERL-RR-85-1-ONR) Avail: NTIS HC A03/MF A01 CSCL 05J

This paper introduces a probabilistic model that is capable of diagnosing and classifying cognitive errors in a general problem-solving domain. The model is different from the usual deterministic strategies common in the area of artificial intelligence because the item response theory is utilized for handling the variability of response errors. As for illustrating the model, the dataset obtained form a 38-item fraction addition test is used, and the students' responses are classified into 34 groups of misconceptions. These groups are predetermined by the result of an error analysis previously done, and validated with the error diagnostic program written by a typical formal logic approach. GRA

N86-13892*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF DIGITAL ALTIMETRY ON PILOT WORKLOAD
R. L. HARRIS, SR. and B. J. GLOVER Nov. 1985 20 p refs
(NASA-TM-86424, L-15989; NAS 1.15:86424) Avail: NTIS HC A02/MF A01 CSCL 05H

A series of VOR-DME instrument landing approaches was flown in the DC-9 full-workload simulator to compare pilot performance, scan behavior, and workload when using a computer-drum-pointer altimeter (CDPA) and a digital altimeter (DA). Six pilots executed two sets of instrument landing approaches, with a CDPA on one set and a DA on the other set. Pilot scanning parameters, flight performance, and subjective opinion data were evaluated. It is found that the processes of gathering information from the CDPA and the DA are different. The DA requires a higher mental workload than the CDPA for a VOR-DME type landing approach. Mental processing of altitude information after transitioning back to the attitude indicator is more evident with the DA than with the CDPA. E.A.K.

N86-13893# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
HYPOTHESIZING AND REFINING CAUSAL MODELS
R. J. DOYLE Dec. 1984 109 p
(Contract N00014-80-C-0505; NR PROJ. RR0-1408)
(AD-A158165; AI-M-811) Avail: NTIS HC A06/MF A01 CSCL 06D

An important common sense competence is the ability to hypothesize causal relations. This paper presents a set of constraints which make the problem of formulating causal hypotheses about simple physical systems a tractable one. The constraints include: (1) a temporal and physical proximity requirement; (2) a set of abstract causal explanations for changes in physical systems in terms of dependences between quantities; and (3) a teleological assumption that dependences in designed physical systems are functions. These constraints were embedded in a learning system which was tested in two domains: a sink and a toaster. The learning system successfully generated and refined naive causal models of these simple physical systems. The causal models which emerge from the learning process support causal reasoning explanation, prediction, and planning. Inaccurate predictions and failed plans in turn indicate deficiencies in the causal models and the need to rehypothesize. Thus, learning supports reasoning which leads to further learning. The learning system makes use of standard inductive rules of inference, as well as the constraints of casual hypotheses to generalize its casual models. Finally, a simple example involving an analogy illustrates another way to repair incomplete causal models. GRA

N86-13894# Massachusetts Inst. of Tech., Cambridge. Artificial Intelligence Lab.
GENERATING AND GENERALIZING MODELS OF VISUAL OBJECTS Memorandum Report
J. H. CONNELL and M. BRADY Jul. 1985 26 p
(Contract N00014-80-C-0505; N00014-77-C-0389)
(AD-A158197; AI-M-823) Avail: NTIS HC A03/MF A01 CSCL 06D

We report on initial experiments with an implemented learning system whose inputs are images of two-dimensional shapes. The system first builds semantic network descriptions of shapes based on Brady's smoothed local symmetry representation. It learns shape models from them using a substantially modified version of Winston's ANALOGY program. A generalization of Gray coding enables the representation to be extended and also allows a single operation, called ablation, to achieve the effects of many standard induction heuristics. The program can learn disjunctions, and can learn concepts using only positive examples. We discuss learnability and the pervasive importance of representational hierarchies. GRA

N86-13895# Washington Univ., St. Louis, Mo. Behavior Research Lab.
A PSYCHOPHYSIOLOGICAL MAPPING OF COGNITIVE PROCESSES Annual Report, 1 Mar. 1984 - 28 Feb. 1985
R. GOLDSTEIN, J. STERN, and L. BAUER 30 Apr. 1985 49 p
(Contract F49620-83-C-0059)
(AD-A158732; REPT-0059-85-1; AFOSR-85-0664TR; AR-2)
Avail: NTIS HC A03/MF A01 CSCL 05J

The experiment was concerned with the effects of varied cognitive and perceptual (i.e., monitoring) demands on patterns of physiological responding. Cognitive demands were varied by manipulating the number of letters (1, 3, or 5) comprising a briefly-presented set which the subject was instructed to encode, rehearse, and, 5 sec later, compare to a single test letter. Perceptual demands were varied by presenting the subject with a cue stimulus 5 sec prior to the set, informing him of the number of letters contained therein. Several physiological measures were recorded, including HR, EOG and probe evoked potentials sampled from the intervals preceding and following the letter set, and task evoked potentials and blinks elicited by the cue, letter set, and test stimuli. Performance data, i.e., RT and error rates, were also recorded. GRA

N86-13896# Smith-Kettlewell Inst. of Visual Sciences, San Francisco, Calif.
THE SPATIAL AND TEMPORAL PARAMETERS OF VELOCITY DISCRIMINATION Annual Report, 1 Apr. - 30 Sep. 1984
S. P. MCKEE 20 Dec. 1984 8 p
(Contract AF-AFOSR-0345-82)
(AD-A158735; AFOSR-85-0572TR) Avail: NTIS HC A02/MF A01 CSCL 06P

The target duration required for the precise discrimination of velocity is quite short, amounting to about 100 msec for a single moving dot or line target. While stroboscopic motion is an adequate substitute for continuous motion in velocity discrimination, optimal discrimination depends on the use of a strobe rate greater than 10 Hz. Generally, human observers have difficulty detecting acceleration in moving targets. Over small distances (0.5 to 1 deg), timing signals from adjacent targets presented in a sequence are pooled, so that information about their relative onset time is lost. For example, given three adjacent lines, separated spatially by 0.1 deg and presented in a sequence (apparent motion) observers are unable to discriminate between a sequence in which a 10 msec interval separates the second from the reverse order (30 msec followed by 10 msec). Velocity discrimination is not affected by blur. Sinusoidal grating targets of 3 cycles per degree or lower produce excellent discrimination. Sinusoidal gratings above 3 cycles per degree in spatial frequency are not adequate for fast velocities (> 1 deg/sec). GRA

N86-13897# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
THE EVENT RELATED BRAIN POTENTIAL AS AN INDEX OF INFORMATION PROCESSING, COGNITIVE ACTIVITY, AND SKILL ACQUISITION: A PROGRAM OF BASIC RESEARCH Final Report, 1 Sep. 1983 - 31 Aug. 1984
E. DONCHIN, C. WICKENS, and M. G. H. COLES 28 Feb. 1985 774 p
(Contract F49620-83-C-0144)
(AD-A159118; CPL-85-1; AFOSR-85-0662TR) Avail: NTIS HC A99/MF A02 CSCL 05J

We review a program of research designed to understand the event-related brain potential (ERP) so that it can be used as a tool in the study of cognitive function and in the assessment of man-machine systems. We have conducted a series of studies on the functional significance of ERPs and have demonstrated that the P300 component is related to memory processes. We have used measures of the same component to evaluate workload, to time mental processes, to study the reciprocity of processing resources, and to extend theories of human information processing. We have also made technical advances in the analysis of the distribution of electrical potentials across the scalp. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-13223
ASPECTS OF OPERATOR INTERFACE DESIGN FOR AN AUTOMATIC TRACKING ANTENNA CONTROLLER
K. E. DEBRUNNER (Dyn-Opus, Inc., Simi Valley, CA) IN: ITC/USA/'84; Proceedings of the International Telemetering Conference, Las Vegas, NV, October 22-25, 1984 . Research Triangle Park, NC, Instrument Society of America, 1984, p. 315-326.

Features of the operator interface and automation of the ACU-6 Antenna Controller are described. Consideration was given to the man-machine interface as a first step, followed by the hardwiring behind the control panel. The human-factors approach accounted

for the panel ergonomics, the antenna control requirements, and the breakdown or combination of individual information displays and control input devices. The use of color was maximized and the degree of clutter was minimized, the latter partially by grouping related functions in horizontal rows for ease of learning and use. Attention and fatigue is aided by color, flash sequences and timing and multifunction switches. The software logic interface was made error-tolerant to offset inputs which conflict with operational functions. M.S.K.

A86-13263
HUMAN FACTORS IN AVIATION. III - SOME COMTEMPORARY ISSUES
E. EDWARDS Aerospace (UK) (ISSN 0305-0831), vol. 12, Oct. 1985, p. 14-19. refs

The balance between human and mechanical factors in aviation is studied. On the flight deck the tasks allocated to machines include flight guidance, changes in power settings, and routine communication functions. The crew is responsible for overall system management because of the human capabilities of strategic decision making. The training of the pilots, in order for them to be able to operate the modern equipment and to have basic control of the aircraft using simple techniques, is discussed. Advanced electronic devices which display information such as CRT, EL, LED, and LCD, and the creation of alphanumeric symbols using various character fonts such as dots, 7-bar characters, and 16-segment bars are described. The importance of luminance, contrast ratio, resolution, color, viewing distance, view angle, and lighting levels in improving legibility of the displayed data is analyzed. The need for continuing the study of aviation ergonomics is discussed. I.F.

A86-13570
INTERMEDIATE COLLIMATION: DESCRIPTION - GOALS - FIRST RESULTS [LA COLLIMATION INTERMEDIAIRE: DESCRIPTION - BUTS - PREMIERS RESULTATS]
J.-P. MENU, J.-M. SEIGNEUR, D. BATEJAT, S. PREDELLA, and B. BARRAULT (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Laboratoire Central de Biologie Aerospatiale, Paris, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 158-161. In French.

Intermediate collimation refers to placing an image between 60 cm and infinity in the field of vision. For pilots, the image is projected beyond the HUD, and thereby at a position of fixed collimation. Vision is then fixed at infinity most of the time. The adaptation times for vision between the HUD and head-down displays and between the HUD and the exterior view are then significant. Accommodation is controlled by the action of the Zinn zonules in deforming the lens of the eye to place the image on the retina. The accommodation times can only be measured indirectly in terms of reaction times after switching views. When six subjects were given tasks which depended on view changes among infinite, 4 m and 1 m foci, an interaction was detected between accommodation and convergence. However, in order to be applicable to pilots, further tests are necessary which include the symbology of displays. M.S.K.

A86-13571
THERMAL STRESS IMPOSED ON PILOTS BY NBC PROTECTIVE CLOTHING [CONTRAINTE THERMIQUE IMPOSEE AU PERSONNEL NAVIGANT PAR LA PROTECTION N.B.C.]
C. BOUTELIER and M. LONCLE (Centre d'Essais en Vol, Bretigny-sur-Orge, France) Medecine Aeronautique et Spatiale, vol. 24, 3rd Quarter, 1985, p. 161-168. In French. refs

The results of experimental determinations of the effects of thermal stress imposed on pilots by NBC clothing and anti-g suits are reported. The NBC cowling provides protection from chemical weapons, is made of neoprene, and has an air supply, but is water vapor resistant. Subjects donned the NBC suits and anti-g equipment and were then strapped in a helicopter seat in a controlled environment. Cutaneous temperatures and heart rates were monitored during the 1-hr sessions at temperatures from 20-40 C. Moderate heating in the chamber was sufficient to induce severe thermal stresses on the subjects. The results imply a necessity exists for limiting flight duration in warm weather climates or seasons, particularly at low altitudes, if pilots wear the protective gear. The situation might be helped if the suits were actively cooled. M.S.K.

A86-13942#
COLD WATER IMMERSION TEST OF PROTOTYPE ANTI-EXPOSURE SUITS FOR AIRCREWS
K. TAGAMI (Tsukuba, University, Sakura, Japan), K. SHIMIZU, and W. OGAWA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, June 1985, p. 49-66. In Japanese, with abstract in English. refs

Different designs of flame resistant and vapor permeable anti-exposure suits were produced and tested in cold water using five male subjects and several thermal manikins. Each human subject was immersed in cold water (about O C) for a period of 60 minutes and rectal and skin temperatures were measured every minute. Measurements of the heat loss in the human subjects were compared with the heat losses of the thermal manikins. It is found that; (1) the rectal temperature of the human subjects showed a very slight decrease (0.4 C maximum) during the 60-minute exposure; (2) a double layered suit design had the highest protection level and (3), the measurements of heat loss in the thermal manikins were in agreement with the heat loss mesurements in the human subjects. The specific materials used in the construction of the suits are listed in a table. I.H.

A86-14238*# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
NORMALIZED PREDICTIVE DECONVOLUTION - A TIME SERIES ALGORITHM FOR MODELING HUMAN OPERATOR DYNAMICS
D. J. BIEZAD (USAF, Institute of Technology, Wright-Patterson AFB, OH) and D. K. SCHMIDT (Purdue University, West Lafayette, iN) (Guidance and Control Conference, Seattle, WA, August 20-22, 1984, Technical Papers, p. 399-414) Journal of Guidance, Control, and Dynamics (ISSN 0731-5090), vol. 8, Nov.-Dec. 1985, p. 768-776. Previously cited in issue 21, p. 3100, Accession no. A84-43446. refs
(Contract NAG4-1)

A86-14311* Texas Univ., Houston.
COMPATIBLE ATMOSPHERES FOR A SPACE SUIT, SPACE STATION, AND SHUTTLE BASED ON PHYSIOLOGICAL PRINCIPLES
B. A. HILLS (Texas, University, Houston) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1052-1058. refs
(Contract NAG9-23)

Fundamental physiological principles have been invoked to design compatible environments for a space suit, Space Station and the spacecraft used to transport the astronauts from earth. These principles include the long-term memory of tissues for a bubble-provoking decompression, the intermittent nature of blood flow in the tight connective tissue(s) responsible for the bends whose incidence in aviators has been shown to be related to bubble volume by the Weibull distribution. In the overall design an astronaut breathing a mixture of 30 percent O2 in N2 for 4-5 h in a spacecraft at 11.9 psia can transfer to a Space Station filled with the same mix at 8.7 psia and, after a further 4-5 h, go EVA at any time without any oxygen prebreathing at any stage. The probable incidence of decompression sickness has been estimated as less than 0.5 percent using the present suit operating at 4.3 psia but the risk could be reduced to zero if the suit pressure were increased to 6.5 psia. Author

A86-14320
THE EFFECT OF LEAKAGE ON THE INSULATION PROVIDED BY IMMERSION-PROTECTION CLOTHING
J. R. ALLAN, C. HIGENBOTTAM, and P. J. REDMAN (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space and Environmental Medicine (ISSN 0095-6562), vol. 56, Nov. 1985, p. 1107-1109. refs

A86-15817#
HERMES ECLSS - REVIEW OF GENERAL REQUIREMENTS AND APPLICATION TO THE SPACEPLANE DEFINITION
L. LEMAIGNEN, M. WEIBEL, C. FAGOT (Avions Marcel Dassault-Breguet Aviation, Saint-Cloud, France), P. BRUDIEU (CNES, Toulouse, France), and K. THOERMER (Dornier System GmbH, Friedrichshafen, West Germany) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 13 p. refs
(Contract CNES-84-5027)
(IAF PAPER 85-304)

Attention is given to the mission requirements and performance capabilities of ESA's Hermes orbiter Environmental Control and Life Support System (ECLSS), which must furnish a 'shirtsleeve' environment for crews. System design has entailed fundamental consideration of physiological oxygen delivery requirements and CO2 concentration limits, temperature and humidity tolerance, and maximum allowable concentration of contaminants. An 'open loop' system accomplishing CO2 reduction in a Sabatier reactor and oxygen generation by electrolysis is presented, together with air and humidity management features, in schematic form. O.C.

A86-15819#
BASIC CONSIDERATION ON CELSS
K. NITTA (National Aerospace Laboratory, Tokyo, Japan), M. YAMASHITA (Tokyo University, Japan), and H. MATSUMIYA (Bio-System International, Tokyo, Japan) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 7 p.
(IAF PAPER 85-307)

The Controlled Ecological Life Support System (CELSS) is a Japanese research effort connected with the design of the NASA Space Station's Japanese Experiment Module. The definition of CELSS technology calls for interdisciplinary research embracing agricultural, chemical, and spacecraft systems engineering. A comprehensive account is presently given of the complex interactions to be found in photosynthetic processes, wet oxidation, and the relations between higher plant, algae, and animal components of the CELSS. O.C.

A86-15820#
ARTIFICIAL CLOSED ECOSYSTEM 'MAN-PLANTS' WITH A FULL REGENERATION OF ATMOSPHERE, WATER AND RATION VEGETABLE PART
B. G. KOVROV, I. A. TERSKOV, I. I. GITELSON, G. M. LISOVSKI, I. M. PANKOVA (AN SSSR, Institut Biofiziki, Krasnoyarsk, USSR) et al. IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 4 p.
(IAF PAPER 85-308)

A configuration and performance evaluation is made of a closed manned spacecraft ecosystem using vegetable cultivation as the basis of oxygen and pure water regeneration from the crew's waste air and water. Wheat, peas, beets, onions, cucumbers, tomatoes and potatoes are grown hydroponically on an expanded clay substrate, using round-the-clock artificial illumination. Systems of this type are intended for long duration space travel. O.C.

A86-15944#
ENSURING SPACE STATION HUMAN PRODUCTIVITY
K. H. MILLER (Boeing Aerospace Co., Seattle, WA) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 8 p. refs
(IAF PAPER 85-500)

The 'human productivity' aspect of the current NASA Space Station Program is discussed. The early development of the concept is reviewed, and its implications are considered. The approach and results of a recently completed study on human productivity are addressed. The elements that affect productivity are identified, and management plans to deal with them, including crew compcsition and organization, individual autonomy and privacy, and physical amenities of the station, are briefly addressed. C.D.

N86-12973# Systems Research Labs., Inc., Dayton, Ohio.
CRITERIA FOR A STATE-OF-THE-ART VISION TEST SYSTEM Final Report
K. MOFFITT and L. V. GENCO May 1985 109 p
(Contract F33615-82-C-0511)
(AD-A157099; AFAMRL-TR-85-004) Avail: NTIS HC A06/MF A01 CSCL 06P

Many vision test/screening devices used in the Armed Services have not changed since the 1940's. The reduction in the size of the pool of qualified aircrew candidates has caused operational Commands to question the validity of these tests. Current objectives of vision testing have evolved from a means to eliminate pilot candidates to methods of predicting aircrew performance. The Naval Aerospace Medical Research Laboratory (NAMRL) is attempting to correlate the results of several vision tests with the visual abilities of pilot trainees as demonstrated during monitored training flights. This report describes status that could be considered as useful parameters for testing in the Armed Forces vision test battery of the future. One major conclusion is that the operational visual task(s) must be suitably described in order to select appropriate clinical and laboratory test measures. Correlations and validation studies can then be performed with cooperative efforts such as those between NAMRL and AFAMRL. GRA

N86-12974# Department of the Navy, Washington, D. C.
LOW TEMPERATURE INFLATOR APPARATUS Patent Application
J. J. ESPOSITO, inventor (to Navy) 2 May 1985 9 p
(AD-D011810; US-PATENT-APPL-SN-729725) Avail: NTIS HC A02/MF A01 CSCL 06G

This invention relates to inflator apparatus for inflating emergency flotation gear such as life rafts and life jackets; and more particularly to an inflator for flotation gear which may be stored at, and operated in, extremely low temperatures. Liquid CO2 (carbon dioxide) cartridges have been used for many years as the main source of pressurized gas for inflating various types of inflatable life saving devices such as rafts, vests, and jackets. Emergency use of these devices by downed aircrewman has occurred mostly in temperate zones. However, these situations now occur more frequently in the arctic region where temperatures below -20 F are not uncommon. At these low temperatures, liquid CO2 changes too slowly to the gaseous phase to provide immediate buoyancy. A rapid change is especially needed in a life raft to enable a downed person in frigid water to board as soon as possible. The longer he or she remains exposed to the cold water awaiting the formation of a boardable raft, the more likely hypothermia will set in. Raft inflation time in excess of five minutes has been observed when CO2 cartridges were stored in an aircraft at sub-zero temperatures and then activated in water at 32 F. Consequently, lives have been needlessly lost. In lieu of liquid CO2 cartridges, solid pyrotechnic inflators have been tried which generate gas from a compacted solid material, but the gas of combustion does not attain the pressure level needed for buoyancy of inflatable gear. GRA

N86-12975# Oak Ridge National Lab., Tenn.
POWER AND SIGNAL TRANSMISSION FOR MOBILE TELEOPERATED SYSTEMS
A. C. MORRIS, JR. and W. R. HAMEL 1985 31 p Presented at the Japan/US Spec. Meeting on Remote Systems Technol., Oak Ridge, Tenn., 26 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013994; CONF-8504132-1) Avail: NTIS HC A03/MF A01

Appropriate means must be furnished for supplying power and for sending controlling commands to mobile teleoperated systems. Because a sizable number of possibilities are available for such applications, methods used in designing both the power and communications systems built into mobile vehicles that serve in radiological emergencies must be carefully selected. This paper describes a number of umbilical, onboard, and wireless systems used in transmitting power that are available for mobile teleoperator services. The pros and cons of selecting appropriate methods

from a list of possible communication systems are also examined. Moreover, hybrid systems combining wireless power transmissions with command-information signals are also possible. DOE

N86-12976# Oak Ridge National Lab., Tenn.
FUTURE DIRECTIONS IN MOBILE TELEOPERATION
W. R. HAMEL 1985 22 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiol. Emergency Response and Recovery, Dallas, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-014308; CONF-8506148-3) Avail: NTIS HC A02/MF A01

Mobile teleoperator systems are the subject of an increasing amount of research and development. This work is motivated by general problems of remote operations in hazardous environments, some of which are very similar to the challenges of radiological emergency response and recovery. Current work appears to fall into two broad economic classes, one in the $100 K range and the other in the $1000 K range. Both are believed to be important for technology development and deployment. Recent developments confirm that we are at the technical doorstep of next-generation mobile systems which integrate dexterous manipulation, high mobility, and telerobotic operation. DOE

N86-13898*# Hamilton Standard, Windsor Locks, Conn.
DEVELOPMENT OF A CARBON FORMATION REACTOR FOR CARBON DIOXIDE REDUCTION Final Report
G. NOYES Sep. 1985 92 p refs
(Contract NAS9-16956)
(NASA-CR-171907; NAS 1.26:171907; SVHSER-9811) Avail: NTIS HC A05/MF A01 CSCL 06K

Applied research, engineering development, and performance evaluation were conducted on a process for formation of dense carbon by pyrolysis of methane. Experimental research showed that dense (0.7 to 1.6 g/cc bulk density and 1.6 to 2.2 g/cc solid density) carbon can be produced by methane pyrolysis in quartzwool-packed quartz tubes at temperatrues of 1100 to 1300 C. This result supports the condensation theory of pyrolytic carbon formation from gaseous hydrocarbons. A full-scale Breadboard Carbon Formation Reactor (CFR) was designed, fabricated, and tested at 1100 to 1200 C with 380 to 2280 sccm input flows of methane. Single-pass conversion of methane to carbon ranged from 60 to 100 percent, with 89 percent average conversion. Performance was projected for an Advanced Carbon Reactor Subsystem (ACRS) which indicated that the ACRS is a viable option for management of metabolic carbon on long-duration space missions. Author

N86-13899*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MASS LOSS OF SHUTTLE SPACE SUIT ORTHOFABRIC UNDER SIMULATED IONOSPHERIC ATOMIC OXYGEN BOMBARDMENT
W. L. MILLER Nov. 1985 14 p refs
(NASA-TM-87149; E-2777; NAS 1.15:87149) Avail: NTIS HC A02/MF A01 CSCL 06K

Many polymeric materials used for thermal protection and insulation on spacecraft degrade significantly under prolonged bombardment by ionospheric atomic oxygen. The covering fabric of the multilayered shuttle space suit is composed of a loose weave of GORE-TEX fibers, Nomex and Kevlar-29, which are all polymeric materials. The complete evaluation of suit fabric degradation from ionospheric atomic oxygen is of importance in reevaluating suit lifetime and inspection procedures. The mass loss and visible physical changes of each test sample was determined. Kapton control samples and data from previous asher and flight tests were used to scale the results to reflect ionospheric conditions at about 220 km altitude. It is predicted that the orthofabric loses mass in the ionosphere at a rate of about 66% of the original orthofabric mass/yr. The outer layer of the two-layer orthofabric test samples shows few easily visible signs of degradation, even when observed at 440X. It is concluded that the orthofabric could suffer significant loss of performance after much less than a year of total exposure time, while the degradation might be undetectable in post flight visual examinations of space suits. E.A.K.

N86-13900*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
HUMAN FACTORS IN SPACE STATION ARCHITECTURE 1: SPACE STATION PROGRAM IMPLICATIONS FOR HUMAN FACTORS RESEARCH
M. M. COHEN Oct. 1985 13 p refs
(NASA-TM-86702; REPT-85167; NAS 1.15:86702) Avail: NTIS HC A02/MF A01 CSCL 05H

The space station program is based on a set of premises on mission requirements and the operational capabilities of the space shuttle. These premises will influence the human behavioral factors and conditions on board the space station. These include: launch in the STS Orbiter payload bay, orbital characteristics, power supply, microgravity environment, autonomy from the ground, crew make-up and organization, distributed command control, safety, and logistics resupply. The most immediate design impacts of these premises will be upon the architectural organization and internal environment of the space station. E.A.K.

N86-13901# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
INFORMATION REQUIREMENTS DETERMINATION: AN EMPIRICAL INVESTIGATION OF OBSTACLES WITHIN AN INDIVIDUAL Ph.D. Thesis
J. R. VALUSEK 1985 201 p
(AD-A158025; AFIT/CI/NR-85-73D) Avail: NTIS HC A10/MF A01 CSCL 05H

This research has suggested that the requirements process be divided into two phases: IRD and IRA. There appears to be sufficient evidence to warrant additional investigation of the IRD phase using the model of inconsistency portrayed in this effort. Inconsistency appears to be a matter of perspective. From an analyst's point of view, the variation in users' needs constitutes inconsistency. From a user's point of view, the variation may be a fact of life resulting from perceptions of need that arise from a dynamic environment. This research is an initial attempt to document the requirements process from a user's perspective and to provide the user some external assistance to attempt to reduce the variation in perceptions of needs. It may be that the perceptions of needs always constitute a requirement from the individual's perspective and that the sorting of requirements from wishes must remain the responsibility of the referee. Perhaps tools oriented to both those roles: That of the user and that of the referee, are necessary. The requirements formulation scratchpad (RFS), as a prototype tool to help the user in the problem formulation phase of information requirements determination, was too complex for the research environment of this study. Based on suggestions from this initial investigation, the second generation of the RFS will be much simpler in design. GRA

N86-13902# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON DESIGN TECHNIQUES FOR ROBOTS (SPACE APPLICATIONS). VOLUME 1, PART A: TECHNICAL RESULTS Final Report
R. J. HAMANN, comp. and W. VANLEEUWEN, comp. Paris ESA Feb. 1985 138 p 4 Vol.
(Contract ESA-5718/83/NL-AN(SC))
(FOK-TR-R-84-110-VOL-1-PT-A; ESA-CR(P)-2048-VOL-1) Avail: NTIS HC A07/MF A01

A space manipulator system is defined, and the kinematics and dynamics of the system are outlined. A system with seven degrees of freedom, rotating joints, electrical actuation, a toroidal work area, and planar/rotational maneuvering is advocated. Its basic application is servicing and maintenance of low Earth orbit platforms for materials processing. The fully extended arm must be able to move a 750 kg payload at 0.02 m/sec. A dedicated programming system must be defined for collision and obstacle avoidance. Author (ESA)

N86-13903# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON DESIGN TECHNIQUES FOR ROBOTS (SPACE APPLICATIONS). VOLUME 1, PART B: TECHNICAL RESULTS Final Report
R. J. HAMANN, comp. and W. VANLEEUWEN, comp. Paris ESA Feb. 1985 247 p refs 4 Vol.
(Contract ESA-5718/83/NL-AN(SC))
(FOK-TR-R-84-110-VOL-1-PT-B; ESA-CR(P)-2048-VOL-2) Avail: NTIS HC A11/MF A01

Control aspects of robots for maintenance and servicing of low Earth orbit materials processing platforms were studied. Electrical architecture and software organization were analyzed. Work required to develop the robot was identified. Active force feedback control is advocated. Author (ESA)

N86-13904# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON DESIGN TECHNIQUES FOR ROBOTS (SPACE APPLICATIONS). VOLUME 2: TECHNICAL APPENDICES Final Report
R. J. HAMANN, comp. and W. VANLEEUWEN, comp. Paris ESA Feb. 1985 121 p 4 Vol.
(Contract ESA-5718/83/NL-AN(SC))
(FOK-TR-R-84-110-VOL-2; ESA-CR(P)-2048-VOL-3) Avail: NTIS HC A06/MF A01

Forward and inverse kinematics of a robot manipulator system for maintenance and servicing of space platforms; software availability; robot languages; control models and plots; coupling and decoupling; and modeling errors are summarized. Author (ESA)

N86-13905# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
STUDY ON DESIGN TECHNIQUES FOR ROBOTS (SPACE APPLICATIONS). VOLUME 3: EXECUTIVE SUMMARY Final Report
R. J. HAMANN, comp. and W. VANLEEUWEN, comp. Paris ESA Feb. 1985 44 p refs 4 Vol.
(Contract ESA-5718/83/NL-AN(SC))
(FOK-TR-R-84-110-VOL-3; ESA-CR(P)-2048-VOL-4) Avail: NTIS HC A03/MF A01

A space manipulator system is defined, and the kinematics and dynamics of the system are outlined. A system with seven degrees of freedom, rotating joints, electrical actuation, a toroidal work area, and planar/rotational maneuvering is advocated. Its basic application is servicing and maintenance of low Earth Orbit platforms for materials processing. The fully extended arm must be able to move a 750 kg payload at 0.02 m/sec. A dedicated programming system must be defined for collision and obstacle avoidance. Control aspects; electrical architecture; and software organization were analyzed. Work required to develop the robot was identified. Active force feedback control is advocated. Author (ESA)

N86-13906# Purdue Univ., West Lafayette, Ind.
ALERTED MONITORS: HUMAN OPERATORS AIDED BY AUTOMATED DETECTORS Final Report
R. D. SORKIN and D. E. ROBINSON Dec. 1984 55 p
(Contract DTRS56-83-C-00047)
(PB85-222750; DOT/OST/P34-85/021) Avail: NTIS HC A04/MF A01 CSCL 05H

In an alerted monitor system, an automated detector assists a human operator in the detection and diagnosis of problems occurring in some monitored process. Air traffic control centers and the flight decks of commercial aircraft include many examples of such systems. This project developed a general model of the altered-monitor system and evaluated the effects on system performance of interactions between the human operator and automated detector. One of the types of interaction evaluated (contingent criterion strategy) yields optimal performance from the combined person-machine system. Two laboratory experiments were performed to evaluate the assumptions of the model and the interactions between the operator and automated components. GRA

N86-14091*# Missouri Univ., Columbia. Dept. of Chemical Engineering.
SOLID WASTE TREATMENT PROCESSES FOR SPACE STATION Final Report
T. R. MARRERO *In* NASA. Johnson (Lyndon B.) Space Center The 1983 NASA/ASEE Summer Faculty Fellowship Research Program Research Reports 55 p Sep. 1983 refs
Avail: NTIS HC A18/MF A01 CSCL 06K

The purpose of this study was to evaluate the state-of-the-art of solid waste(s) treatment processes applicable to a Space Station. From the review of available information a source term model for solid wastes was determined. An overall system is proposed to treat solid wastes under constraints of zero-gravity and zero-leakage. This study contains discussion of more promising potential treatment processes, including supercritical water oxidation, wet air (oxygen) oxidation, and chemical oxidation. A low pressure, batch-type treament process is recommended. Processes needed for pretreatment and post-treatment are hardware already developed for space operations. The overall solid waste management system should minimize transfer of wastes from their collection point to treatment vessel. Author

N86-14160# Joint Publications Research Service, Arlington, Va.
BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR LONG-DURATION SPACE FLIGHTS
I. ANDREYEV and Y. Y. SHEPELEV *In its* USSR Rept.: Space (JPRS-USP-85-005) p 71-74 30 Sep. 1985 Transl. into ENGLISH from Izv. (Moscow), 11 Feb. 1985 p 3
Avail: NTIS HC A08

A brief overview of the necessary life support equipment requirements for long term space flights is presented. Self contained, closed, ecological systems for the generation of oxygen are presented as possibilities. G.L.C.

N86-14161# Joint Publications Research Service, Arlington, Va.
ARCHITECT DISCUSSES SPACE HABITAT DESIGNS
S. ZIGUNENKO *In its* USSR Rept.: Space (JPRS-USP-85-005) p 75-77 30 Sep. 1985 Transl. into ENGLISH from Pravda (Moscow), 4 Dec. 1984 p 3
Avail: NTIS HC A08

General considerations for the interior design of spacecraft intended for long duration space flight were reviewed from a human factors engineering standpoint. It is important that those responsible for spacecraft design not allow their work to be overshadowed by their sense of gravity and the general restrictions of a terrestrial environment. G.L.C.

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-13974
THE OLDEST TRACES OF LIFE (ACCORDING TO PAPERS PRESENTED AT THE 27TH SESSION OF THE INTERNATIONAL GEOLOGICAL CONGRESS) [DREVNEISHIE SLEDY ZHIZNI /PO MATERIALAM 27-I SESSII MEZHDUNARODNOGO GEOLOGICHESKOGO KONGRESSA/]
I. N. KRYLOV (AN SSSR, Geologicheskii Institut, Moscow, USSR) Priroda (ISSN 0032-874X), Sept. 1985, p. 68-76. In Russian. refs

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A86-14114
A POSSIBLE ENERGETIC ROLE OF MINERAL SURFACES IN CHEMICAL EVOLUTION
L. M. COYNE (San Jose State University, Moffett Field, CA) Origins of Life (ISSN 0302-1688), vol. 15, no. 3, 1985, p. 161-206. refs

The role of the interaction of mineral surfaces (MSs) with such sources of energy (E) as ionizing radiation and mechanical stress in chemical evolution and the origin of life is discussed. The effect of MS-E interaction in terms of spectroscopic properties of minerals, catalysis, and interactions of E with condensed phases are considered, as well as some commonly accepted and novel means by which the MS activity may be enhanced by E inputs. The contribution of natural radioactive decay and triboelectric E is assessed, and is proposed to be potentially competitive with solar energy for systems of heterogeneous reactions. Studies of clays are presented that demonstrate novel luminescence properties, indicating energy storage and transfer processes in the MSs, which are interpreted so as to provide a basis for estimating the potential significance of MS-E interactions for driving clay surface chemistry. I.S.

A86-14115
FACT AND ASSUMPTION IN STUDIES ON THE ORIGINS OF LIFE
N. W. PIRIE Origins of Life (ISSN 0302-1688), vol. 15, no. 3, 1985, p. 207-212. refs

The prevailing tendency in the current theories of the origins of life to assume the absolute necessity of preexisting proteins, nucleic acids, and other biochemical molecules for the process of biopoesis is critically assessed. It is suggested that the events which might take place in the course of few million years on moist mineral surfaces smeared with bituminous material and exposed to prebiotic physical and chemical environment should be considered for experiments on the origins of life. In such a system, transition elements, the orienting ability of silicates and other mineral crystals, the small molecules generated by light, and the reactive centers generated on sunlit oil and tar should be taken into account. I.S.

A86-14123
SUBMARINE HYDROTHERMAL VENTS AND ASSOCIATED GRADIENT ENVIRONMENTS AS SITES FOR THE ORIGIN AND EVOLUTION OF LIFE
J. A. BAROSS (Washington, University, Seattle) and S. E. HOFFMAN (Oregon State University, Corvallis) Origins of Life (ISSN 0302-1688), vol. 15, no. 4, 1985, p. 327-345. refs
(Contract N00014-79-C-004; NSF DEB-81-11307; NSF DPP-81-20473)

The hypothesis of the submarine hydrothermal environment providing the conditions for abiotic synthesis of organic compounds, macromolecules, and precells, leading to the evolution of living organisms is proposed. The geological, chemical, and biological changes in the Archean ocean and atmosphere are studied and compared with the characteristics of a present-day hydrothermal environment. The geological and geochemical features of the hydrothermal circulation system, which provides the energy for converting inorganic precursors to organic compounds, are discussed. The hot vents and cool Galopagos-type vents that result from large and small fractures are described. The changes which have produced differences in the Archean and present-day oceanic environments are analyzed. Examples of bacteria which support vent communities are presented. The influence of temperature and O2 gradient on the evolution of the ecosystem is investigated. A comparison of present-day volcanic environments to ancient microbial habitats based on fossil records is provided. I.F.

A86-14774#
A NOTE ON SELF-REPLICATING INFORMATION YIELDING THE CHEMICAL ORIGIN OF LIFE
J. C. PENAFORTE and B. BASEIA (Paraiba, Universidade Federal, Joao Pessoa, Brazil) Revista Brasileira de Fisica (ISSN 0374-4922), vol. 15, March 1985, p. 32-36. Research supported by the Coordenacao do Aperfeicoamento do Pessoal de Ensino Superior and CNPq. refs

Stabilization in the length of growing polymers, is obtained through the analogy between laser crossing threshold and critical biological phenomena. Reference is made to the theory of Tsalis and Ferreira (1983) concerning the transition from inanimate matter to life. I.H.

A86-15919*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EVOLUTION OF COMPLEX LIFE
J. BILLINGHAM (NASA, Ames Research Center, Moffett Field, CA) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 15 p. refs
(IAF PAPER 85-465)

The emergence of complex living organisms in the context of evolutionary biology, planetary environments, and space events is investigated. The application of data on biological evolution, climatology, and the chemical and physical environments of the earth's surface, to explain the development of extraterrestrial life is described and an example is provided. The possibility of extraplanetary disturbances such as, meteorite and comet bombardments, and supernova explosions, causing the elimination of preexisting life and allowing advanced life development is analyzed. The possible existence of different life cycles (genetic and reproductive strategies) on other planets is studied. The GAIA hypothesis (Lovelock, 1979) which states living things modify the global environment to their own advantage is examined. The improved identification of habitable planetary environments and the possible existence of a form of extraterrestrial intelligent life is discussed. I.F.

A86-15921#
THE ANTHROPIC PRINCIPLE - PROBABILITY AND THE POSSIBILITY OF EXTRATERRESTRIAL LIFE
P. J. HALL (Newcastle-upon-Tyne, University, England) IAF, International Astronautical Congress, 36th, Stockholm, Sweden, Oct. 7-12, 1985. 6 p. refs
(IAF PAPER 85-468)

The influence of the Anthropic Principle (AP) on conventional hypotheses for the existence of extraterrestrial life and on strategies in search for extraterrestrial life is discussed. Three relationships between local and general cosmological laws, the Copernican relationship, the Mach relationship, and the Anthropic relationship, are defined. Two assumptions, which are there must be absolute uniformity in the universe, and the degree of fine tuning varies from law to law and constant to constant, are analyzed in the study of the AP and the probability of the existence of extraterrestrial intelligence (ETI). The search for the existence of ETI, which is based on Anthropic and Copernican ideas, is described. It is hypothesized that electromagnetic beam signals are emitted by ETI for detection and interpretation by other ETI. The relationship between communication with electromagnetic beams and quantum mechanics and relativity is studied. I.F.

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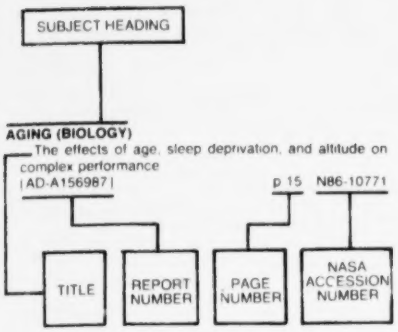

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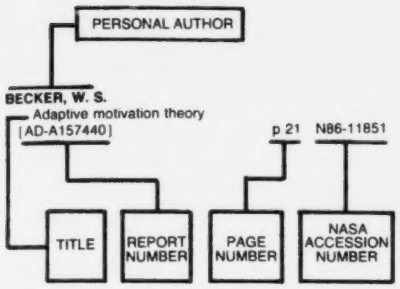

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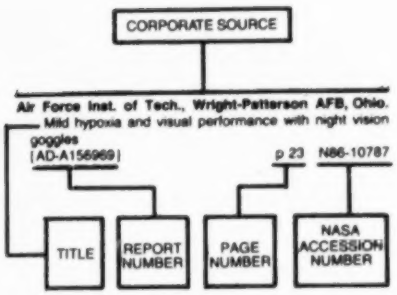

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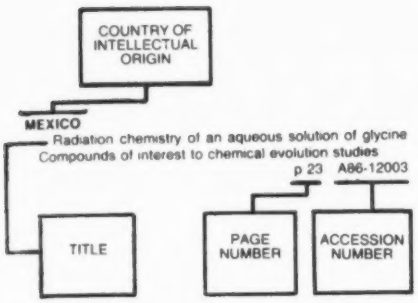

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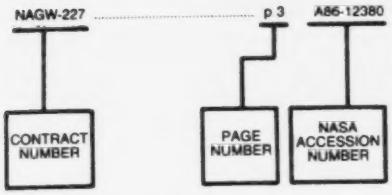

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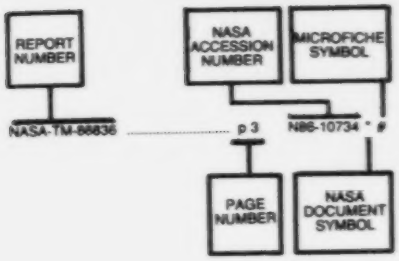

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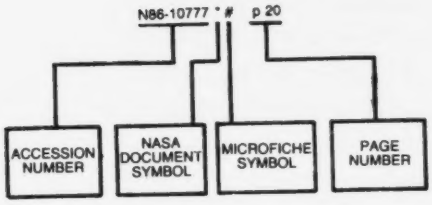

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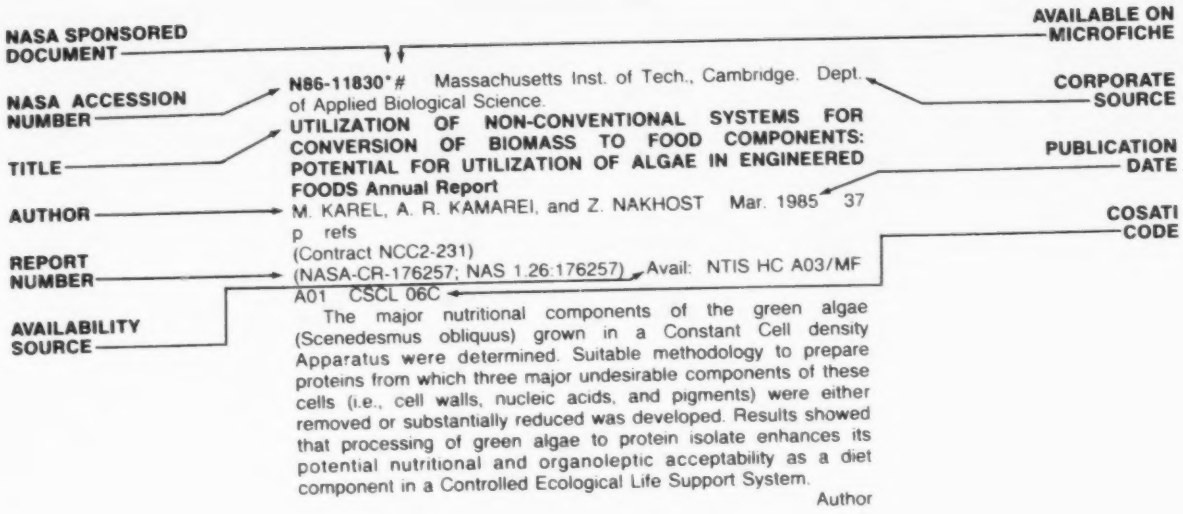
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TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHOR
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
COSATI CODE
REPORT NUMBER
(Contract NCC2-231)
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
AVAILABILITY SOURCE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

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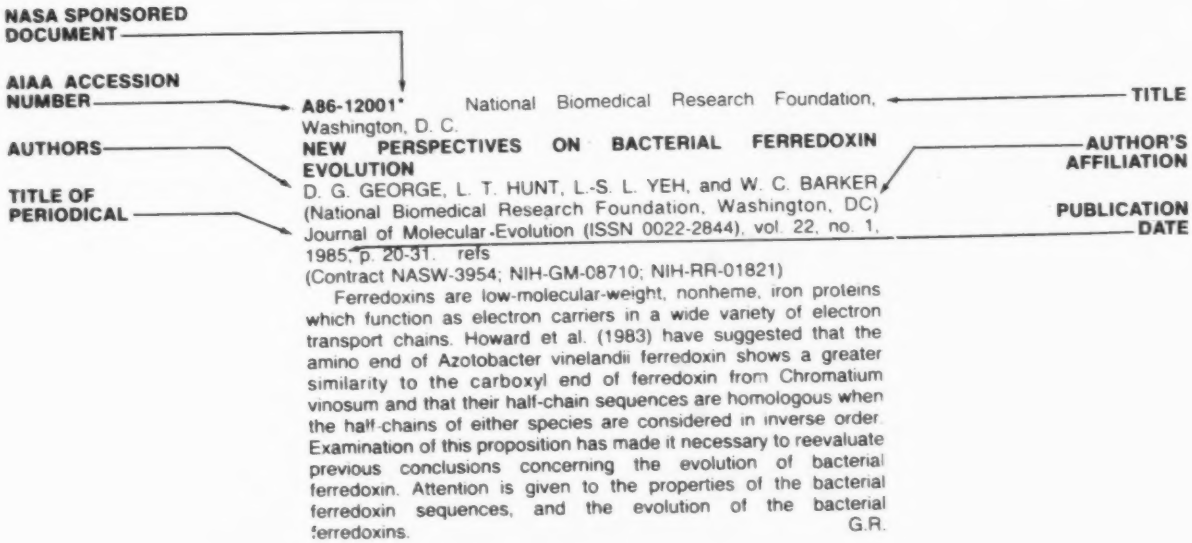
NASA SPONSORED DOCUMENT
AIAA ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
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NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
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TITLE OF PERIODICAL
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)
PUBLICATION DATE
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

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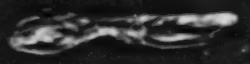

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NASA SP-7011(283)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 283)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in March 1986 in

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- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 184 reports, articles and other documents announced during March 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 54 Man/System Technology and Life Support 73
Includes human engineering; biotechnology; and space suits and protective clothing.

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 283)

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-16751
THE EFFECT OF KALLIKREIN ON THE DEVELOPMENT OF A GENERAL ADAPTATION SYNDROME [VLIIANIE KALLIKREINA NA RAZVITIE OBSHCHEGO ADAPTATSIONNOGO SINDROMA]
IU. V. KOLENDA, S. V. VOVCHUK, and A. P. LEVITSKII (Gorodskaia Klinicheskaia Bol'nitsa No. 2, Odessa, Ukrainian SSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), July-Aug. 1985, p. 52-54. In Russian. refs

The effect of kallikrein on the resistance of rats to immobilization stress has been investigated, experimentally. It is shown that intravenous injection of kallikrein increased the peripheral blood concentration of aldosterone, a steroid hormone regulating sodium and potassium metabolism. It is suggested that the adaptogenic effect of kallikrein may be mediated by the adrenal cortex. I.H.

A86-16752
THE EFFECT OF AURICULAR ELECTRIC STIMULATION ON MYELOPEPTIDE PRODUCTION AND EARLY REACTIONS OF BLOOD SYSTEMS CELL POPULATIONS IN THE PRESENCE OF IMMOBILIZATION STRESS [VLIIANIE AURIKULIARNOI ELEKTROSTIMULIATSII NA PRODUKTSIIU MIELOPEPTIDOV I RANNIE REAKTSII KLETOCHNYKH POPULIATSII SISTEMY KROVI PRI IMMOBILIZATSIONNOM STRESSE]
A. M. VASILENKO, L. A. ZAKHAROVA, and O. I. BELOUSOVA (Tsentral'nyi Nauchno-Issledovatel'skii Institut Refleksoterapii; Institut Immunologii, Moscow, USSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Sept.-Oct. 1985, p. 26-30. In Russian. refs

A86-16754
SOME RESULTS OF A STUDY OF THE BIOENERGETICS OF RAT MUSCLE IN WEIGHTLESSNESS [NEKOTORYE ITOGI IZUCHENIIA BIOENERGETIKI MYSHTS V NEVESOMOSTI]
E. S. MAILIAN, E. A. KOVALENKO, and L. B. BURAVKOVA Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Sept.-Oct. 1985, p. 69-73. In Russian. refs

Oxidative phosphorylation and the activity of cytochrome oxidase and lactate dehydrogenase were studied in the skeletal muscles of rats exposed to weightlessness on board three different Cosmos biosatellites. It is found that exposure to weightlessness for a period of 18-22 days was accompanied by a marked inhibition of oxidative metabolism and glycolysis in skeletal muscles having different morphofunctional specializations. Disorders of oxidative phosphorylation and reduced enzyme activity were also found. Muscular tissue was restored by the end of the first month of a readaptation period. I.H.

A86-16783
THE GEROPROTECTIVE ACTIVITY OF 2,6-DIMETHYL 3,5-DIETHOXYCARBONYL 1,4-DIHYDROPYRIDINE [GEROPROTEKTORNAIA AKTIVNOST' 2,6-DIMETIL 3,5-DIETOKSIKARBONIL 1,4-DIGIDROPIRIDINA]
L. K. OBUKHOVA, G. IA DUBUR, G. D. TIRZIT, IA. R. ULDRIKIS (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR; AN LSSR, Institut Organicheskogo Sinteza, Riga, Latvian SSR), and N. M. EMANUEL Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 284, no. 5, 1985, p. 1271-1274. In Russian. refs

A86-16800
MODERN CONCEPTS REGARDING SOME NONTRADITIONAL NEUROENDOCRINE MECHANISMS OF STRESS [SOVREMENNYE PREDSTAVLENIIA O NEKOTORYKH NETRADITSIONNYKH NEIROEN DOKRINNYKH MEKHANIZMAKH STRESSA]
V. D. SLEPUSHKIN, IU. B. LISHMANOV, G. K. ZOLOEV, and I. A. PRUM (Vsesoiuznyi Kardiologicheskii Nauchnyi Tsentr, Tomsk, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 16, Oct.-Dec. 1985, p. 106-118. In Russian. refs

The mechanisms involved in stress reaction (SR) were studied by analyzing humoral changes that follow application of stress (in man and animals). It is shown that, besides the stimulation of the hypothalamus-hypopheseal-adrenal system (HHAS), the SR syndrome includes activation of the parathyroid (PS) and epipyseal (ES) systems, as well as the release of opioid neuropeptides. The PS is seen to play the key role during the initial anxiety, phase (AP) of the SR, with an almost immediate increase of blood parathormone accompanied by an increase of blood Ca and, consequently, eventual activation of the HHAS. The ES activity effects the transmission from the AP to the resistance phase of the SR, by further stimulating the HHAS and intracellular cyclic AMP/cyclic GMP systems. The opioids, particularly endorphins and enkephalins, contribute to the SR as neurotransmitters. I.S.

A86-16901* Maryland Univ., Baltimore.
FIBRE-TYPE SPECIFICITY AND EFFECT OF THYROID HORMONE ON GLUCOSE 6-PHOSPHATE DEHYDROGENASE ACTIVITY IN NORMAL AND DENERVATED SKELETAL MUSCLES OF THE RAT
S. R. MAX, E. C. B. HALL-CRAGGS, and M. CHACON (Maryland, University, Baltimore) Histochemical Journal (ISSN 0018-2214), vol. 17, 1985, p. 699-706. refs
(Contract NIH-NS-15760; NIH-HD-16596; NAG2-100)

A86-16902* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DICYCLOHEXYLCARBODIIMIDE-SENSITIVE ATPASE IN HALOBACTERIUM SACCHAROVORUM
H. KRISTJANSSON and L. I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) Archives of Biochemistry and Biophysics (ISSN 0003-9861), vol. 241, Sept. 1985, p. 590-595. refs

Membranes from Halobacterium saccharovorum contained a cryptic ATPase which required Mg(2+) or Mn(2+) and was activated by Triton X-100. The optimal pH for ATP hydrolysis was 9-10. ATP or GTP were hydrolyzed at the same rate while ITP, CTP, and UTP were hydrolyzed at about half that rate. The products of ATP hydrolysis were ADP and phosphate. The ATPase required high concentrations (3.5 M) of NaCl for maximum activity. ADP

was a competitive inhibitor of the activity, with an apparent Ki of 50 micro-M. Dicyclohexylcarbodiimide (DCCD) inhibited ATP hydrolysis. The inhibition was marginal at the optimum pH of the enzyme. When the ATPase was preincubated with DCCD at varying pH values, but assayed at the optimal pH for activity, DCCD inhibition was observed to increase with increasing acidity of the preincubation medium. DCCD inhibition was also dependent on time of preincubation, and protein and DCCD concentrations. When preincubated at pH 6.0 for 4 h at a protein:DCCD ratio of 40 (w/w), ATPase activity was inhibited 90 percent. Author

A86-16924* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE ROLE OF REABSORPTION IN THE SPECTRAL DISTRIBUTION OF PHYTOPLANKTON FLUORESCENCE EMISSION
D. J. COLLINS, I. S. MCDERMID (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), D. A. KIEFER, and J. B. SOOHOO (Southern California, University, Los Angeles) Deep-Sea Research (ISSN 0198-0149), vol. 32, 1985, p. 983-1003. NASA-supported research. refs

A theoretical model has been developed to describe an experimentally observed spectral shift in the fluorescence emission from phytoplankton as a result of the internal reabsorption of that emission. This model accounts for both the absorption of the primary excitation and the modification of the fluorescence through the reabsorption of the emitted light by the chloroplast and by the surrounding medium. Comparisons are made between the results of the theoretical model and data derived from experiments using a number of different phytoplankton species, each adapted to varying light conditions. The details of the model are discussed, and the consequences of its interpretation on the spectral distribution of the fluorescence emission from phytoplankton are examined. Author

A86-17467
BRAIN ASYMMETRY IN ANIMALS [ASIMMETRIIA MOZGA ZHIVOTNYKH]
V. L. BIANKI Leningrad, Izdatel'stvo Nauka, 1985, 295 p. In Russian. refs

Laboratory studies on the morphological and functional lateral specialization of the large hemispheres of the animal brain are presented. Special consideration is given to aspects of individual and species-related asymmetry, the biological and environmental factors involved in its development, and the phenomenon of lateralization in the analysis of physical stimuli by the animal brain. Lateral specialization of the vertebrate brain is discussed in the framework of the induction-deduction hypothesis (Bianki, 1982 and 1983), and its role in the processes of adaptation and biological evolution is considered. I.S.

A86-17607*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH CENTER LIFE SCIENCES PAYLOAD - OVERVIEW OF RESULTS OF A SPACEFLIGHT OF 24 RATS AND 2 MONKEYS
P. X. CALLAHAN, C. SCHATTE, R. E. GRINDELAND, G. BOWMAN (NASA, Ames Research Center, Moffett Field, CA), W. A. LENCKI (GE Management and Technical Services Co., Moffett Field, CA) et al. AIAA, Shuttle Environment and Operations Conference, 2nd, Houston, TX, Nov. 13-15, 1985. 11 p.
(AIAA PAPER 85-6092)

Engineering and biological data gathered with the research animal holding facilities (RAHFs) used on the Spacelab 3 mission are summarized. The animals totaled 24 rats and two squirrel monkeys. The RAHFs included biotelemetry, cameras and environmental monitoring equipment. The primary mission goal was engineering evaluation of the RAHFs and ancillary equipment. Tightly-fitted seals were found to be a necessity for keeping waste and food particles from contaminating the Spacelab equipment. All the rats returned with little muscle tone and suppressed immune systems. The monkeys displayed highly individual responses to spaceflight. Both species exhibited reduced abilities to maintain meticulously clean furs in weightlessness. Details of several physiological changes detected during post-flight autopsies are provided. M.S.K.

A86-17679* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EFFECT OF HIGH ENERGY (HZE) PARTICLE RADIATION (AR-40) ON AGING PARAMETERS OF MOUSE HIPPOCAMPUS AND RETINA
D. E. PHILPOTT, K. KATO, R. CORBETT, J. STEVENSON, S. BLACK (NASA, Ames Research Center, Moffett Field, CA), W. SAPP (Tuskegee Institute, AL), J. MIQUEL, K. A. LINDSETH (San Jose State University, CA), and E. V. BENTON (San Francisco, University, CA) Scanning Electron Microscopy, vol. 3, 1985, p. 1177-1182. refs

Eight month old C57BL6 mice were exposed (head only) to 0.5 rad or 50 rads of Argon particles at the Lawrence Berkeley Radiation Facility, CA. Neuromotor performance was assessed monthly for six months beginning twelve weeks post-irradiation using a 'string test'. The decline in motor performance was dose-related and none of the animals was able to complete the task after four months of testing. Morphological changes were monitored six and twelve months post-irradiation by light and electron microscopy. The synaptic density in the CA-1 area of the hippocampus decreased six and twelve months after irradiation. The decrease after twelve months was less than after six months. The width of the outer nuclear layer (ONL) of the retina increased with increasing dose. The number of blood vessels between the ONL and the ganglion layer decreased twelve months after irradiation and this area did not show significant accumulation of age pigment. Author

A86-17808
THE UNIQUENESS OF ARCHAEBACTERIA
R. A. GARRETT (Aarhus Universitet, Denmark) Nature (ISSN 0028-0836), vol. 318, Nov. 21, 1985, p. 233-235.

Recent advances in understanding the molecular biology of the archaebacteria, which demonstrate the uniqueness of this kingdom, are reviewed. Findings on the characteristics of nucleotide sequences, genome instability, virus-host systems, the regulation of gene expression, and the presence of introns in the genome of archaebacteria are summarized. Disputes concerning the origin of archaebacteria are briefly reviewed. C.D.

A86-18026* Saskatchewan Univ., Saskatoon.
PLANETARY ECOLOGY; PROCEEDINGS OF THE SIXTH INTERNATIONAL SYMPOSIUM ON ENVIRONMENTAL BIOGEOCHEMISTRY, SANTA FE, NM, OCTOBER 10-14, 1983
D. E. CALDWELL, ED. (Saskatchewan, University, Saskatoon, Canada), J. A. BRIERLEY, ED., and C. L. BRIERLEY, ED. Symposium supported by USGS, DOE, NASA, et al.;. New York, Van Nostrand Reinhold Co., 1985, 604 p. For individual items see A86-18027 to A86-18034.
(Contract NGW-378)

Topics presented include biological evolution and planetary chemistry; C-1 compounds; transport, deposition, and weathering; sulfur transformations; ground water; transformation processes for nitrogen oxides; and soils. Papers are presented on immunological studies on the organic matrix of recent and fossil invertebrate shells; biogenic gases in sediments deposited since Miocene times on the Walvis Ridge, South Atlantic Ocean; aspects of the biogeochemistry of Big Soda Lake, NV; mesophilic manganese-oxidizing bacteria from hydrothermal discharge areas at 21 deg North on the East Pacific Rise; and autotrophic growth and iron oxidation and inhibition kinetics of Leptospirillum ferrooxidans. Consideration is also given to thermophilic archaebacteria occurring in submarine hydrothermal areas; fate of sulfate in a soft-water, acidic lake; geochemical conditions in the ground water environment; microbial transformations as sources and sinks for nitrogen oxides; and the biogeochemistry of soil phosphorus. I.S.

A86-18027* Boston Univ., Mass.
MICROBIAL MATS AND MODERN STROMATOLITES IN SHARK BAY, WESTERN AUSTRALIA
S. GOLUBIC (Boston University, MA) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 3-16. Research supported by the Bureau of Mineral Resources, Baas Becking Institute, and Roche Pharmaceutical Co. refs
(Contract NSF GA-43391; NSF OCE-12999; NSF EAR-76-84233; NSF EAR-79-11200; NSF EAR-81-07686; NSG-7588; NAGW-141)

Distribution, external morphology, texture, and microbial composition of microbial mats in Hamelin Pool, Shark Bay, Western Australia, have been studied and reviewed along a composite representative profile starting from the permanently submerged zone, across the zones of periodic flooding, toward permanently emerged land and coastal dunes. The following nine types of algal mats have been recognized: colloform, gelatinous, smooth, pincushion, tufted, mamillate, film, reticulate, and blister. Solar ponds represent a particular environment. The mat types represent microbial communities that are characterized by one or more dominant microorganisms. The colonization and stabilization of loose sediment is carried out by a microbial assemblage of generalists that prepare the ground for later replacement and succession by specialized microflora. Lithification of microbial mats takes place periodically, mainly during the austral summer. This process is destructive for the microbial community but increases the preservation potential of the stromatolitic structures. Author

A86-18029
PEPTIDOGLYCAN ENVELOPE IN THE CYANELLES OF GLAUCOCYSTIS NOSTOCHINEARUM
O. T. SCOTT (Fort Lewis College, Durango, CO) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 27-40. Research supported by the Ford Foundation and Navajo Nation. refs

The cyanelles found in Glaucocystis have been investigated in several ultrastructural and biochemical studies in unsuccessful attempts to detect the presence of a peptidoglycan envelope, a basal layer of non-Archaebacterial prokaryotic cell walls. Disruption of intact Glaucocystis cells with a glass tissue homogenizer permitted the isolation of the uniquely shaped cyanelles. Preservation of intactness and shape of the cyanelles in a hypotonic isolation medium was terminated by lysozyme at final concentrations of less than 50 micrograms g/ml. At 5 micrograms g/ml, lysozyme achieves lysis within a few seconds, and this was found to be the optimal concentration. Lysozyme-mediated lysis was inhibited by N-acetyl-glucosamine-2, a known competitive inhibitor. Diaminopimelic acid was detected by standard amino acid-analysis methods, prompting the conclusion that the cyanelles of Glaucocystis are cyanobacterial endosymbionts. Author

A86-18030
RECOVERY OF VIABLE THERMOACTINOMYCES VULGARIS AND OTHER AEROBIC HETEROTROPIC THERMOPHILES FROM A VARVED SEQUENCE OF ANCIENT LAKE SEDIMENT
N. L. PARDUHN and J. R. WATTERSON (USGS, Denver, CO) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 41-53. refs

A86-18031
ASPECTS OF THE BIOGEOCHEMISTRY OF BIG SODA LAKE, NEVADA
R. S. OREMLAND, R. L. SMITH, and C. W. CULBERTSON (USGS, Menlo Park, CA) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 81-88. refs

Characteristics of Big Soda Lake, NV, including its pelagic productivity, rates of anaerobic mineralization (sulfate reduction, methane oxidation and methanogenesis), inorganic chemistry, seasonality, and littoral-zone processes, are presented on the basis of results from ongoing studies begun in 1980. The chemical analysis showed high S (5600 mg/l) and low Fe (less than 0.1 mg/l) contents. Annual water column productivity was found to be 500 gC/sq m, of which 60 percent is due to phytoplankton; 10 percent to purple photosynthetic bacteria, Ectothiorhodospira vacuolata (at a depth of 21 m); and 30 percent to bacterial chemocutotropy occurring within the photosynthetic bacterial plate. The methanogenic activity was maximal at pH 9.7 (the pH of the Big Soda Lake waters) and was found to be supported noncompetitively by methanol, methylamines, and methionine (but not by H2, acetate, or formate). No detectable N2 fixation or denitrification was found in water columns of the upper 30 m, although in the littoral zone an N-fixing cyanobacterium colonizes the plant (Ruppia sp.) beds in midsummer. I.S.

A86-18032
MESOPHILIC MANGANESE-OXIDIZING BACTERIA FROM HYDROTHERMAL DISCHARGE AREAS AT 21 DEG NORTH ON THE EAST PACIFIC RISE
H. L. EHRLICH (Rensselaer Polytechnic Institute, Troy, NY) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 186-194. refs

A86-18033
AUTOTROPHIC AND MIXOTROPHIC GROWTH AND METABOLISM OF SOME MODERATELY THERMOACIDOPHILIC IRON-OXIDIZING BACTERIA
A. P. WOOD and D. P. KELLY (Warwick, University, Coventry, England) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 251-262. Research supported by Biogen, S.A. refs

A86-18034
THERMOPHILIC ARCHAEBACTERIA OCCURRING IN SUBMARINE HYDROTHERMAL AREAS
K. O. STETTER (Regensburg, Universitaet, West Germany) IN: Planetary ecology; Proceedings of the Sixth International Symposium on Environmental Biogeochemistry, Santa Fe, NM, October 10-14, 1983 . New York, Van Nostrand Reinhold Co., 1985, p. 320-332. refs

Extremely thermophilic anaerobic archaebacteria have been isolated from submarine solfatara fields in Italy. They are sulfur-hydrogen autotrophs, sulfur respirers, methanogens, and fermentative organisms. The most extremely thermophilic isolates grow between 80 and 110 C, with an optimum around 105 C. Author

A86-18150
CHANGES IN THE MORPHOFUNCTIONAL AND CYTOCHEMICAL INDICES OF BLOOD LEUKOCYTES AFTER EXPOSURE TO LOW-INTENSITY MICROWAVE RADIATION [KHARAKTER IZMENENIIA MORFOFUNKTSIONAL'NYKH I TSITOKHIMICHESKIKH POKAZATELEI LEIKOTSITOV KROVI PRI VOZDEITSTVII NA ORGANIZM MIKROVOLN NIZKIKH INTENSIVNOSTEI]
M. I. RUDNEV and N. M. GONCHAR (Kievskii Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Sept.-Oct. 1985, p. 645-649. In Russian. refs

A86-18181
RESPONSES OF CAT RED-NUCLEUS NEURONS TO AUDITORY SIGNALS [REAKTSII NEIRONOV KRASNOGO IADRA KOSHKI NA ZVUKOVYE SIGNALY]
S. A. SHINKARENKO, N. V. BRATUS, and I. N. KUDRIAVTSEVA (Vinnitskii Meditsinskii Institut, Vinnitsa, Ukrainian SSR; AN SSSR, Institut Fiziologii, Leningrad, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 284, no. 6, 1985, p. 1506-1509. In Russian. refs

A86-18397* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INCREASED GLUCONEOGENESIS IN RATS EXPOSED TO HYPER-G STRESS
B. C. DALIGCON, J. OYAMA, and K. HANNAK (NASA, Ames Research Center, Moffett Field, CA) Life Sciences (ISSN 0024-3205), vol. 37, no. 3, 1985, p. 235-241. refs

The effect of glucogenesis on the plasma glucose and liver glycogen of rats exposed to hyper-G stress is investigated. Twelve male Sprague-Dawley rats are injected with C-14 lactate, alanine, of glycerol, and six of the rats are exposed to 3.1 G for 0.25, 0.50, and 1.0 hr. The plasma glucose and liver glycogen of the centrifuged and noncentrifuged rats are analyzed. A significant increase in the C-14 incorporation of the substrate into the plasma glucose and liver glycogen is observed in the centrifuged rats. The injection of 5-methoxyindole-2-carboxylic acid, a gluconeogenesis inhibitor, results in a blocked increase in plasma glucose and liver glycogen. The role of epinephrine on the hyperglycemic and liver glycogen responses of centrifuged rats is studied. It is concluded that the initial increase in plasma glucose and liver glycogen in rats exposed to hyper-G stress is the result of an increased rate of gluconeogenesis. I.F.

A86-18398* Wisconsin Univ., Madison.
A MATERNAL DEFECT IS RESPONSIBLE FOR GROWTH FAILURE IN VITAMIN D-DEFICIENT RAT PUPS
R. BROMMAGE and H. F. DELUCA (Wisconsin, University, Madison) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), vol. 248, 1984, p. E216-E220. Research supported by the Wisconsin Alumni Research Foundation. refs
(Contract NAG2-167; NIH-AM-14881)

A86-18399* Wisconsin Univ., Madison.
VITAMIN D-DEFICIENT RATS PRODUCE REDUCED QUANTITIES OF A NUTRITIONALLY ADEQUATE MILK
R. BROMMAGE and H. F. DELUCA (Wisconsin, University, Madison) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), vol. 248, 1984, p. E221-E226. Research supported by the Wisconsin Alumni Research Foundation. refs
(Contract NAG2-167; NIH-AM-14881)

A86-18400* Wisconsin Univ., Madison.
1,25-DIHYDROXYVITAMIN D3 NORMALIZES MATERNAL FOOD CONSUMPTION AND PUP GROWTH IN RATS
R. BROMMAGE, K. JARNAGIN, and H. F. DELUCA (Wisconsin, University, Madison) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), vol. 248, 1984, p. E227-E231. Research supported by the Wisconsin Alumni Research Foundation. refs
(Contract NAG2-167; NIH-AM-14881)

A86-18513
THE EFFECT OF A MICROWAVE RADIATION (2.45 GHZ CW) ON THE MOLT OF HOUSE FINCHES (CARPODACUS MEXICANUS)
F. E. WASSERMAN, T. H. KUNZ (Boston University, MA), T. LLOYD-EVANS (Manomet Bird Observatory, MA), S. P. BATTISTA (Arthur D. Little, Inc., Cambridge, MA), and D. BYMAN (Pennsylvania State University, Dunmore) Space Solar Power Review (ISSN 0191-9067), vol. 5, no. 3, 1985, p. 261-270. refs
(Contract EPA-68-02-3278)

A86-18744
VISUAL PERCEPTION AND MEMORY: INFORMATION PROCESSES AND NEURON MECHANISMS [ZRITEL'NOE VOSPRIIATIE I PAMIAT': INFORMATSIONNYE PROTSESSY I NEIRONNYE MEKHANIZMY]
K. N. DUDKIN Leningrad, Izdatel'stvo Nauka, 1985, 208 p. In Russian. refs

The process of visual perception (VP) is based on sensorial information, but cannot take place without the participation of memory. The physiological mechanisms involved in three types of visual memory (iconic, short-term, and long-term memory) and their role in VP is examined. Theories of detector-mediated VP (through detectors of edge, contour, brightness, and other features of the object) and spatial frequency filtering are discussed, and results of psychophysical, electrophysiological, and behavioral experiments are presented in support of the theoretical models. It is concluded that the concepts of spatial frequency filters and features detectors supplement each other and must be both invoked to explain the experimental observations. I.S.

A86-18840
EFFECT OF FASTING ON HYPOXIA TOLERANCE OF MICE IN RELATION TO OXYGEN CONSUMPTION AND HEART RATE
T. SUZUKI (Tokyo, University, Japan) and C. WATANABE Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1198-1202. refs

Mice more than 8 weeks old were fasted for 1 or 2 d and challenged by severe acute hypoxia. The hypoxia survival times (ST) were compared to the body weight, oxygen consumption, or heart rate (HR) of each animal. The duration of fasting was found to be important in determining ST. Oxygen consumption or HR was negatively correlated with ST, whether mice were fasted or not. The regression line (lnST on HR) in the fed (control) group did not significantly differ from that of 2-d fasted groups, but those of fed and 1-d fasted groups differed. These results suggest that, in fasting for 2 d, the reduction in energy consumption was a major determining factor of hypoxia survival; in 1-d fasting, other factors might operate to determine the tolerance. Author

A86-18841
PLASMA VOLUME AND ESTIMATED LIVER PLASMA FLOW DURING HYPERBARIC AND HYPEROXIC EXPOSURES IN AWAKE DOGS
D. R. GROSS, B. J. GENTILE, D. W. WELCH, W. P. FIFE (Texas A & M University, College Station), and W. G. KRAMER (Houston, University, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1203-1208. refs
(Contract PHS-210-81-6103; NOAA-NA-81AAD00092)

A86-18842
FURTHER STUDIES ON THE APPLICATION OF THE COMPARTMENTALIZATION/AIRLOCK CONCEPT TO AIRCRAFT AND SPACECRAFT
H. S. FANG, M. L. TSAI, and I. T. LEA (National Taiwan University, Taipei, Republic of China) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1209-1212. Sponsorship: National Science Council of the Republic of China. refs
(Contract NSC-72-0412-B002-22)

The effect of the application of the compartmentalization/airlock on accidental decompression was studied in conscious rats, mice, and guinea pigs. It was observed that in unprotected rats and mice, 78 of 102 middle ears (76.5 percent) exhibited hemorrhages with their eardrums intact; and in unprotected guinea pigs, 37 of 50 eardrums (74 percent) revealed rupture associated with hemorrhages of all middle ears (100 percent). Seven cases of malleus fractures (14 percent) were also found in unprotected guinea pigs. On the other hand, none of the protected animals showed signs of middle ear barotrauma. The protective effect on the tolerance of middle ears in the present study showed the same tendency as that on the tolerance of lungs in a previous study. These findings indicate that the application of the compartmentalization/airlock would be of great value in protection against accidental rapid decompression of pressurized aircraft and spacecraft. Author

N86-14839# Desmatics, Inc., State College, Pa.
A NONLINEAR REGRESSION PROCEDURE FOR EVOKED POTENTIAL DATA ANALYSIS
C. A. MAURO Jun. 1985 47 p
(Contract N00014-79-C-0128)
(AD-A157680; TR-112-18) Avail: NTIS HC A03/MF A01 CSCL 06S

The recording and subsequent analysis of evoked potential activity has proven useful for the evaluation of neutral dysfunction resulting from impact acceleration injury involving the head and neck. In animal impact acceleration experiments involving Rhesus monkeys, somatosensory evoked potentials showed an increase in latency following nonlethal experiments. In order to assess quantitatively and objectively the amplitude and duration of the latency effect following impact acceleration, a nonlinear mathematical model has been proposed. This technical report describes a nonlinear regression procedure for fitting the proposed model directly to empirical latency data. A FORTRAN computer program listing is provided. Author (GRA)

N86-14840# Office of Naval Research, London (England).
BIOMATERIALS RESEARCH IN WEST GERMANY: AN ASSESSMENT Technical Report
T. C. ROZZELL 14 Aug. 1985 15 p
(AD-A158951; ONRL-R-3-85) Avail: NTIS HC A02/MF A01 CSCL 06E

West Germany is one of the leading countries in Europe for research in biomaterials. Researchers have developed a number of new techniques and methods utilizing a wide range of synthetic and natural materials for use in medicine. Exotic ceramics, metals, and plastics are being used both in animals and in humans for such things as tissue repair, wound coverings, drug delivery, and prostheses. The West German scientists, bioengineers, and clinicians are very aggressive in attacking new problems related to the use of biomaterials in therapy. GRA

N86-14841# Office of Naval Research, London (England).
BIOLOGICAL SCIENCES AND BIOELECTROMAGNETICS IN EUROPE Summary Technical Report
T. C. ROZZELL 26 Aug. 1985 38 p
(AD-A159221; ONRL-R-4-85) Avail: NTIS HC A03/MF A01 CSCL 06E

This report examines in detail bioelectromagnetics research in Europe and provides an overview of several aspects of general biomedical, biomaterials, and biotechnological research. GRA

N86-14842# Washington Univ., Seattle. Bioelectromagnetics Research Lab.
EFFECTS OF LONG-TERM LOW-LEVEL RADIOFREQUENCY RADIATION EXPOSURE ON RATS. VOLUME 9: SUMMARY Final Report, Jun. 1980 - Jul. 1984
A. W. GUY, C. K. CHOU, L. L. KUNZ, J. CROWLEY, and J. KRUPP Aug. 1985 24 p
(Contract F33615-80-C-0612)
(AD-A159512; SR-29; USAFSAM-TR-85-64) Avail: NTIS HC A02/MF A01 CSCL 06R

For 25 months 100 male SPF rats were exposed to pulsed 2450-MHz circularly polarized microwaves at an average power density of 0.48 mW/sq cm. Another 100 rats served as sham-exposed controls. This report summarizes the results of the eight previous volumes which reported on measurements of 155 parameters. For most of the parameters no statistical difference was found between the exposed and sham-exposed groups. This report discusses a few end-points that were statistically different. GRA

N86-14843# Kentucky Univ., Lexington.
PHYSIOLOGY/BIOCHEMISTRY OF PHOTOACTIVATION OF O2 EVOLUTION: PROBES FOR THE S-STATE PROTEIN Progress Report, 1 Jun. 1983 - 31 May 1985
G. M. CHENIAE Mar. 1985 14 p refs
(Contract DE-AS05-83ER-13072)
(DE85-016834; DOE/ER-13072/1) Avail: NTIS HC A02/MF A01

This work details the conditions necessary to achieve routinely the complete photoactivation of virtually totally inactive water oxidizing complexes in NH2OH extracted leaf segments. The photoactivation process per se proved entirely similar to the process previously described for Mn deficient algae, Mn sufficient algae cultured heterotrophically, and NH2OH extracted algae. Further studies showed that without dark preincubation of NH2OH extracted leaf segments PS 2, but not PS 1, was susceptible to weak light photoinhibition (t1/2 approx. 2.5 min). Also reported are studies which kinetically characterize the photoinhibition process using NH2OH or Tris extracted isolated chloroplasts, prove the site affected resides on the oxidant side of PS 2, and give preliminary identification of the polypeptide which must be synthesized on chloroplast 70S ribosomes for the recovery from photoinhibition and for recovery of the capacity of PS 2 to carry-out photoactivation of the Mn-S-state enzyme. DOE

N86-14844# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Applied Mathematics.
QUANTITATIVE MODELS DESCRIBING THE KINETICS OF TUMOR CELL PROLIFERATION: A COMPARISON TO EXPERIMENTAL DATA
J. ATEN (Amsterdam Univ.) and J. GRASMAN Dec. 1984 9 p refs
(CWI-AM-R8418; B8565125; AD-B093143L) Avail: NTIS HC A02/MF A01

Pedigrees of cells from a mouse osteosarcoma line are analyzed. The generation time data of cells of 12 pedigrees is used to estimate the parameters in two transition probability models of the cell cycle. In cultures perturbed by a change of culture medium, generation times are shorter than in control cultures. In the control cultures, seven cells with anomalously large division delays were deleted in the process of estimating the parameters in the transition probability models. In the data of pedigrees of irradiated cells such cases occur more frequently. This is a strong indication that a quiescent state must be introduced in the model of the cell cycle and that a delay due to DNA repair must be taken into account. In a test of the model of Brooks, Bennett and Smith (1980) the data of sister-sister correlations contained the necessary information to reject this model for cells a mouse osteosarcoma line. Author (ESA)

N86-14845# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
29 Jan. 1985 121 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-004) Avail: NTIS HC A06

Progress in U.S.S.R. biomedical and behavioral sciences is reported. Topics discussed include: a grotechnology; biochemistry; bionics; biotechnology; environment; human factors; laser effects; medicine; microbiology; public health; and radiation biology.

N86-14847# Joint Publications Research Service, Arlington, Va.
RADIOSENSITIVITY OF ANIMALS IRRADIATED IN MODIFIED GAS MEDIUM: MODIFICATION OF CEREBRAL SYNDROME IN MICE BY HYPOXIC HYPOXIA AND HYPEROXIA DURING IRRADIATION
I. B. USHAKOV and M. M. ABRAMOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-004) p 110-115 29 Jan. 1985 Transl. into ENGLISH from Radiobiologiya (Moscow), v. 24, no. 5, Sep.-Oct. 1984 p 693-697
Avail: NTIS HC A06

The effect of breathing pure normobaric oxygen on the radiosensitivity of hemopoietic tissue and the small intestine was studied previously. The possible modifying action of hyperoxia and hypoxic gas mixtures (HGM) on the course of the cerebral syndrome was evaluated. Thus the authors who studied rabbits that succumbed to radiation, diagnosed a higher oxygen demand in the irradiated animals and recommended the use of oxygen therapy in X-ray treatment of head tumors. Irradiation of the heads of mice with 8 meV electrons in doses greater than 350 Gr produced what the authors believe to be a paradoxical result: Pure normobaric oxygen had a protective effect, as is true for anoxia, though the effect was significantly less pronounced. Presence of an oxygen effect (aggraviation by oxygen and protection by HGM) was demonstrated with radiation doses of 0.052-0.258 KI (expansion unknown)/kg and 47-123 Gr 6. In the latter case, however, the modifying effect was absent with radiation doses of 123-213.8 Gr. This paper evaluates possible modification of the cerebral syndrome in mice by a modified gas medium during gamma-irradiation of the head and torso. B.W.

N86-14848# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 5, SEPTEMBER - OCTOBER 1985
O. G. GAZENKO, ed. 25 Nov. 1985 147 p refs Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 96 p
(JPRS-USB-85-007) Avail: NTIS HC A07

Progress in Soviet space biology and aerospace medicine is reported. Topics discussed include: regular diet aspects of cosmonauts, metabolic distinctions in human red blood cells, hypokinesia, long term space flight effects, circulation and hemostasis in borderline hypertension, cardiac changes for dogs during extended hypokinesia, microelectronics, medical equipment tests, pharmacology, neurosciences.

N86-14856# Joint Publications Research Service, Arlington, Va.
ROENTGENOLOGICAL AND PATHOMORPHOLOGICAL CHANGES IN HEART OF DOGS SUBMITTED TO HYPOKINESIA FOR SIX MONTHS
I. G. KRASNYKH, N. A. GAYDAMAKIN, and V. G. PETRUKHIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 54-59 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 41-46
Avail: NTIS HC A07

The effect of 6-month hypokinesia on the cardiac function and pathomorphological changes in dogs was investigated. The heart size during systolic and diastolic contractions, stroke volume and contractile function were measured once a month using an X-ray unit and a kymograph. After the hypokinetic exposure six dogs were sacrificed and their hearts were examined morphologically and histochemically. The recovery processes were investigated on two other dogs that were allowed to survive for 30 days after exposure. The 6-month hypokinesia led to a significant decrease in the heart size, stroke volume, cardiac index and the contractile function. Morphological examinations revealed atrophic changes in the myocardium. Electron-microscopy investigations demonstrated focal destructive changes in myofibers and in mitochondria, some of them were dense while others had a more transparent matrix and degraded cristae. Histochemical data also suggest atrophic and destructive changes in the myocardium.
E.A.K.

N86-14857# Joint Publications Research Service, Arlington, Va.
CHANGES IN PHYSICAL CONDITION, VESTIBULAR FUNCTION AND BONE SYSTEM OF RATS SUBMITTED TO LONG-TERM ROTATION
A. A. SHIPOV, V. N. SHVETS, L. A. TABAKOVA, and O. Y. KABITSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 60-69 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 46-53
Avail: NTIS HC A07

Unrestrained rats were rotated for 21 and 30 days at 1.1 and 2.0 G. The exposure did not deteriorate their equilibrium function or physical condition, however, the exposure decreased the reactivity and sensitivity of the semicircular canals. Bone parameters, longitudinal and transverse bone growth, metaepiphysis morphometry, indicated that the rats developed an acute stress reaction accompanied by an inhibited growth of limb bones during the first 7 days of rotation. By experimental day 30 the animals became adapted to the new environment. E.A.K.

N86-14858# Joint Publications Research Service, Arlington, Va.
CONTRACTILE PROPERTIES OF RAT MUSCLE FIBERS DURING LONG-TERM EXPOSURE TO +2 GX ACCELERATIONS
V. S. OGANOV, S. A. SHURATOVA, and M. A. SHIRVINSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 70-74 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 53-56
Avail: NTIS HC A07

The effect of 21-day exposure to +2 Gx and +1.1 Gx on the contractile properties of different muscle groups of rate fore- and hindlimbs was examined, using glycerinated myofibers in the ATP+Ca sq solution. It was found that the isometric contraction strength and velocity increased, the performance of the postural extensors also grew; that of the soleus m. in the +2 Gx rats and that of the triceps brachii m. in the +2 Gx and +1.1 Gx rats. The contractile changes of the flexors of fore- and hindlambs were insignificant and sometimes oppositely directed. The different responses of the muscles to acceleration were associated with the differences in their function, metabolism and biomechanics.
E.A.K.

N86-14868# Joint Publications Research Service, Arlington, Va.
DRUGS AND SURFACTANTS USED TO PREVENT CAISSON DISEASE IN RATS
V. V. VLASOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 123-126 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 86-87
Avail: NTIS HC A07

Changes in the blood-clotting system and vascular reactions have a substantial effect on rate of gas production, rate of escape of gas through the lungs, size of bubbles and their stability in development of decompression sickness. These reactions are an important factor that determines tolerance to decompression. By altering the body's reaction to the free gas phase that appears in

tissues one can deliberately influence tolerance to decompression. Drugs medication capable of enhancing tolerance to decompression were investigated and the effects of some surfactants (SF) on the course of caisson disease are examined. E.A.K.

N86-14869# Joint Publications Research Service, Arlington, Va.
EFFECT OF 24,25-DIHYDROXYCHOLECALCIFEROL ON AMINO ACID METABOLISM OF HYPOKINETIC RATS
T. F. VLASOVA, Y. B. MIROSHNIKOVA, M. S. BELAKOVSKIY, A. N. KOCHETKOVA, and I. N. SERGEYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 127-129 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 88-89
Avail: NTIS HC A07

A 30-day restriction of motor activity of animals against the background of diets differing in calcium and phosphorus content led to decline of amino acid pool of blood, and excessive uptake of phosphorus aggravated the effect of hypokinesia. The effect of 24,25-dihydroxycholecalciferol--24,25(OH0 2D3 -- on amino acid metabolism of animals, are discussed and the use of this compound together with other agents for prevention and treatment of mineral metabolism under hypokinetic conditions is outlined. The possibility of normalizing amino acid metabolism under hypokinetic conditions with use of diets with a specific proportion of calcium and phosphorus and supplemental administration to animals of an active metabolite of vitamin D3--24,25(OH)2D3 is explored. E.A.K.

N86-14870# Joint Publications Research Service, Arlington, Va.
BIOCIDAL SYNTHETIC COATINGS BASED ON HIGH-MOLECULAR METALOORGANIC COMPOUNDS
V. F. MISHCHENKO, V. A. ZUBOV, and Y. G. YEREMENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 130-134 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 89-92
Avail: NTIS HC A07

Long-term stays of man and animals in closed life-support systems lead to contamination of the room and objects in it by various microorganisms. Traditional sterilization methods was found to be either ineffective or extremely difficult and unsafe. Use of biologically active paint and varnish is an effective means of preventing development of microorganisms in closed life-support systems when they contain as biocidal supplements low-molecular organic compounds, organic derivatives of arsenic, mercury and copper. However, these materials are often highly toxic for man and animals. The low-molecular compounds used as biocidal additives in paint and varnish do not yield the desired result, since this biocidal agents usually do not have a broad spectrum of protective action. Due to constant exudation, the biocidal agents are utilized unwisely, which ultimately leads to reduction of efficacy and duration of protective action of the coating. E.A.K.

N86-15859# School of Aerospace Medicine, Brooks AFB, Tex.
POTENCY OF PHOTOFLASH-PRODUCED RETROGRADE AMNESIA IN RATS Final Technical Paper, Dec. 1983 - Mar. 1984
K. R. PAGE and T. G. WHEELER Jul. 1985 12 p
(Contract AF PROJ. 7757)
(AD-A159149; USAFSAM-TP-85-1) Avail: NTIS HC A02/MF A01 CSCL 05I

A photoflash has been shown to be an effective amnesiac under certain conditions. The objective of this study was to evaluate the effectiveness of a photoflash in relation to the potency of the preceding event, a foot shock of varying intensities. The task was a single avoidance-trial paradigm. The subject was placed in a small aversive chamber with a door that allowed the subject to enter a large, preferred chamber. Once inside the preferred chamber, the subject received a 1-s foot shock followed by a photoflash. On the avoidance trail, the subject was again placed in the aversive chamber and the time required to enter the preferred chamber was measured. If the photoflash had produced retrograde amnesia (RA), the time required to enter would be small. Retrograde amnesia was demonstrated for the 80-, 85-, and 100-V foot-shock test trials. At 40 V the voltage may not have been great enough to be felt by the subject. For groups examined at shock levels above 100 V, the foot shock was so potent that a photoflash was ineffective in producing RA. Our conclusion was that the photoflash was an effective amnesiac until the intensity of the foot shock became more potent than the photoflash; this is consistent with the recency theory generated in serial learning and memory tasks. GRA

N86-15860# California Inst. of Tech., Pasadena. Lab. of Chemical Physics.
APPLICATION OF ELECTRON-TRANSFER THEORY TO SEVERAL SYSTEMS OF BIOLOGICAL INTEREST
R. A. MARCUS and N. SUTIN 1985 9 p refs Presented at the Workshop on Antennas and Reaction Centers of Photosynthetic Bacteria - Structure, Interactions and Dynamics, Feldafing, West Germany, 23 Mar. 1985 Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE85-015835; BNL-36836; CONF-8503159-1) Avail: NTIS HC A02/MF A01

Electron-transfer reaction rates are compared with theretically calculated values for several reactions in the bacterial photosynthetic reaction center. A second aspect of the theory, the cross-relation, is illustrated using protein-protein electron transfers. DOE

N86-15861# Case Western Reserve Univ., Cleveland, Ohio.
ELECTRON REACTIONS IN MODEL AND BIOLOGICAL SYSTEMS
G. BAKALE 1985 6 p refs Presented at DOE Radiological and Chemical Physics Contractors' Meeting, Richland, Washington, 9 Apr. 1985
(Contract DE-AC02-78EV-04746)
(DE85-016062; CONF-8504170-1) Avail: NTIS HC A02/MF A01

Our pulse-conductivity studies of electrons in nonpolar liquids and reversed-micellar solutions in which electron mobilitis, (MU) sub e 's, that range from 10 to the power -3 to 1000 sq cm/Vs and electron-attachment rate constants, k sub e 's, that range from 10 to the 8th power to 10 to the 14th power MM to the - 1 s to the - 1 will be briefly described as well as the mechanisms of electron transport and attachment that are consistent with this millionfold range of (MU) sub e's and k sub e 's. Included among the electron-attachment results presented will be the K sub e's of 150 chemicals that have been classified using animal tests as being carcinogens or noncarcinogens. The k sub e-carcinogenicity correlation will be compared with the bacterial mutagenicity-carcinogenicity correlation which is the basis of the Ames Salmonella bioassay, the short-term test that is most widely used to screen potentially carcinogenic chemicals. Finally, our use of the Ames Salmonella tester strains as a biological detector of electrophilic carcinogens will be discussed. DOE

N86-15862# Oak Ridge National Lab., Tenn.
FREEZING OF LIVING CELLS
P. MAZUR 1985 24 p refs Presented at the 2nd National Summer School on Cryobiology and Freeze-Drying, Toulbuchin, Bulgaria, 1 Aug. 1985
(Contract DE-AC05-84OR-21400)
(DE85-016297; CONF-8508116-1) Avail: NTIS HC A02/MF A01

It can be calculated that a living cell will survive more than 5000 years at -196 C. This ability to essentially stop biological time has important implications in medicine and agriculture, and in biological research. In medicine the chief implications are in the banking of transplantable tissues and organs and in vitro fertilization. In agriculture the applications stem in part from the role of frozen embryos in amplifying the number of calves produced by high quality cows. The problem is how can cells survive both the cooling to such very low temperatures and the return to normal temperatures. The answers involve fundamental characteristics of

cells such as the permeability of their surface membranes to water and solutes. These characteristics determine whether or not cells undergo lethal internal ice formation and other response during freezing and thawing. DOE

N86-15863# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abt. Weltraumbiologie.
INVESTIGATIONS OF THE EFFECTS OF GRAVITY ON PARAMECIUM CAUDATUM STRUCTURE AND BEHAVIOR Thesis - Bonn Univ.
R. HEMMERSBACH Jul. 1985 70 p refs In GERMAN; ENGLISH summary Report will also announced as translation (ESA-TT-963)
(DFVLR-FB-85-40; ISSN-0171-1342) Avail: NTIS HC A04/MF A01; DFVLR, Cologne DM 27

Paramecium caudatum was used to study the behavior of the contractile vacuolar system, the nutrient uptake, cyclose, multiplication rate, and ultrastructure under simulated weightlessness using a fast-running clinostat and a modified agar method. In comparing 0 and 1 g behavior, no modification is detected, except for the vacuolar system. The slowed and irregular functioning behavior of the contractile vacuolar system due to an inner timing modification is influenced by gravity. Negative geotaxis of Paramecium caudatum is not confirmed. The effects of gravity on vacuole formation, situation, and number cannot be determined. Author (ESA)

N86-15864# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Abteilung Biophysik.
ON THE EFFECTS OF X IRRADIATION ON THE BACILLUS SUBTILIS SPORES IN A DAY AND WET SYSTEM Thesis - Fachhochschule, Giessen, West Germany
E. WOIZENKO Apr. 1985 82 p refs In GERMAN; ENGLISH summary Report will also be announced as translation (ESA-TT-968)
(DFVLR-FB-85-44; ISSN-0171-1342) Avail: NTIS HC A05/MF A01; DFVLR, Cologne DM 29

Bacillus subtilis spores were irradiated to study the influence of intracellular water and to explain the modulating role of water in the development of biological radiation damage. The effects of repair deficiency in mutants regarding sensitivity to radiation in dry and wet systems were studied to explain the damage process in correlation with cell water content. The experiments were verified in multiplication rate and lag phase curves. Wild and mutant species are more sensible to ionizing radiation in a dry medium than in a wet medium. The water content used as a radiation protective substance reduces inactivation. Rec+ species (wild species) is more sensitive to ionizing radiation under extremely dry conditions and in a vacuum than Rec- species (mutants) due to a reduced repair ability. Rec- species deficient in the Rec A gene develop other repair processes to compensate for damage. The results show the variety of the cell repair processes. Author (ESA)

N86-15865# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 4, JULY - AUGUST 1985
O. G. GAZENKO, ed. 4 Nov. 1985 156 p refs Transl. into ENGLISH of Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul.-Aug. 1985 96 p
(JPRS-USB-85-006) Avail: NTIS HC A08

Biological and medical problems encountered in space flight are the subjects of journal articles from the U.S.S.R. Some sample titles are: (1) determining human physical work capacity; (2) effect of threat stress on psychomotor stability of pilots differing in anxiety levels; (3) effect of 7 day immersion hypokinesia on characteristics of precision movements; (4) long term rotation of rats as applied to the problem of artificial gravity; (5) microflora of chufa, a potential higher plant component of biological life support systems for man; (6) crew training; and (7) automatic determination of cardiac output from rheogram of the trunk.

N86-15876# Joint Publications Research Service, Arlington, Va.
INTENSITY OF LIPID PEROXIDATION IN HYPOKINETIC RAT TISSUES
T. Y. SHIDLOVSKAYA *In its* USSR Rept.: Space Biol. and Aerospace Med., Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 65-69 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 45-48
Avail: NTIS HC A08

The intensity of lipid peroxidation in the homogenates and mitochondria of the liver, heart and skeletal muscle of hypokinetic rats was measured. The primary products of lipid peroxidation, i.e., diene conjugates, were accumulated in all tissues on hypokinesia days 3, 15 and 30. The content of the final product--malonic dialdehyde--in the mitochondria increased on hypokinesia days 15 and 30. The low level of NADPH, an ascrobate-dependent lipid peroxidation, in the mitochondria at early stages of hypokinesia (up to 15 days) and diene conjugates in homogenates on hypokinesia day 7 can be attributed to an activation of the protective systems of the organism against the immobilization stress. It is suggested that at early stages of hypokinesia the process of lipid peroxidation, or to be more precise, lipid hydroperoxidation can be blocked. Author

N86-15877# Joint Publications Research Service, Arlington, Va.
EFFECT OF 24,25-DIHYDROXYVITAMIN D3 ON OSTEOGENETIC PRECURSOR CELLS IN IMMOBILIZED RATS
V. N. SHVETS, T. Y. BURKOVSKAYA, Z. Y. VNUKOVA, and O. Y. KABITSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 70-76 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 48-53
Avail: NTIS HC A08

The experiments were carried out on Wistar SPF rats that were immobilized for 35 days. By heterotopic marrow cell transplantation under the kidney capsule to the normal rates and by cloning these cells in vitro it was found that osteogenetic potentials were significantly inhibited and the amount of osteogenetic precursor cells was reduced. The addition of 24,25(OH)2D3 vitamin (at a dose of 1.25 micrograms per day) to the animal die led to the normalization of the above parameters. It is assumed that immobilization-associated osteoporosis develops via, among other mechanisms, inhibition of histogenesis of stromal precursor cells. The beneficial role of vitamin D3 is actually the activation of histogenesis of these cells which results in the recovery of bone remodelling during immobilization. Author

N86-15878# Joint Publications Research Service, Arlington, Va.
BASIC RESULTS OF EXPERIMENTS WITH LONG-TERM ROTATION OF RATS AS APPLIED TO THE PROBLEM OF ARTIFICIAL GRAVITY
A. R. KOTOVSKAYA, I. B. KRASNOV, and A. A. SHIPOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 77-81 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 53-57
Avail: NTIS HC A08

Rats housed as a group per cage were centrifuged for 21 and 30 days at 1.1. and 2.0 G. The following parameters were measured: (1) motor activity, body mass, static and dynamic endurance, acceleration (+Gz) tolerance, vestibular function, equilibrium function, skeletal muscle contractility, bone dynamics, gas exchange, blood biochemistry, weight of adrenals, thymus and thyroid gland; (2) morphology of adrenals, thyroid gland, and cortex of the cerebellum nodulus; and (3) biochemistry of blood hormones, energy metabolism enzymes in the liver, bone phosphatase, myosin Ca-Mg-ATPase in the myocardium, protein sulfhydryl groups in the cerebellar motor cortex. It was demonstrated that prolonged (1/50 of their life time) centrifugation of unrestrained rats causes no deterioration of many physiological functions, i.e., rotation produces no adverse effects on the animal body. Author

N86-15881# Joint Publications Research Service, Arlington, Va.
DETERMINATION OF INCREMENT OF BACILLUS SUBTILIS BIOMASS IN WEIGHTLESSNESS
F. BERGTER, D. HARZ, P. J. MULLER, K. MUND, U. GUNTER, T. HESSE, R. HARTMANN, G. WANKE, M. G. TAIRBEKOV, G. P. PARFENOV et al. *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 92-95 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 63-65
Avail: NTIS HC A08

This paper presents the results of a microbiological experiment carried out by the Soviet and GDR scientists onboard SALYUT-6. The experiment was performed using a Bacillus subtilis suspension in the Jena unit. The purpose of the experiment was to study the time-course variations of the cell biomass increase in zero-g. The cell culture development was measured with respect to the utilization rate of glucose or casein hydrolysate in the nutrient medium and the rate of protein accumulation in cells. It has been shown that the rate of biomass increment in zero-g lags behind the 1 g level. It can be concluded that the decreased metabolic activity of bacterial cells in zero-g is associated with changes in the cell population distribution and physiochemical parameters of the nutrient medium. Author

N86-15882# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF MICROFLORA OF CHUFA, A POTENTIAL HIGHER PLANT COMPONENT OF BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN
L. S. YUNUSOVA and N. A. DRUGOVA *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 96-100 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 65-68
Avail: NTIS HC A08

The microbiological characteristics of the chufa plant grown alone or in combination with wheat and vegetables were investigated. The results showed that the bacterial flora of chufa plants did not change significantly. The bacterial count decreased during nodule formation. The number of actinomycetes increased when chufa and wheat plants were grown together. By the end of vegetation fungi were accumulated in the chufa rhizosphere. Among the physiological groups involved in the transformation of nitrogen-containing compounds ammonifiers were predominant. At the germination stage ammonification and denitrification processes increased, cellulose-decomposing bacteria appeared, oligonitrophilic forms occurred. From the microbiological point of view chufa plants can be used in the higher plant component of the biological life support system. Author

N86-15883# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF DISTINCTIONS REFERABLE TO GROWTH, DEVELOPMENT AND METABOLISM OF CLOSTERIOPSIS ACICULARIS ALGAE WHEN CELLS ARE LIMITED IN NITROGEN AS RELATED TO BIOLOGICAL LIFE-SUPPORT SYSTEMS FOR MAN
A. A. ANTONYAN, M. A. LEVINSKIKH, and N. I. SUKHOVA *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 101-108 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 69-73
Avail: NTIS HC A08

The growth, development and metabolism of a new form of green unicellular algae Closteriopsis acicularis were investigated from the point of view of their potential use in the biological life support system (BLSS). Their growth and biochemical characteristics were studied as a function of nitrogen supply. During the nitrogen-deficiency cultivation the growth rate remained unchanged, cell division and biomass increment was uncoupled, and carbohydrate formation was predominant. The content of carbohydrates increased at the expense of assimilable fractions, particularly starch. These data can be used in the selection of an optimum nitrogen level for the case of algal continuous cultivation, in the development of diets that can be provided by a BLSS incorporating Closteriopsis acicularis. Author

N86-15892# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF MINERAL NUTRITION OF A NEW, FORM OF MICROALGAE TO BE USED IN BIOLOGICAL LIFE-SUPPORT SYSTEMS
M. A. LEVINSKIKH and O. G. LIVANSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 149-151 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 95-96
Avail: NTIS HC A08

Closteriopsis acicularis var. africana Hind unicellular green algae attracted the attention of researchers because, unlike Chlorella, it has a readily broken down cell membrane and, according to preliminary data, its biomass contains considerable amounts of readily assimilated carbohydrates. It is felt that inclusion of this alga in the photoautotrophic part of a biological life-support system (BLSS) for man could optimize its features considerably. One of the main questions in studying unicellular algae as applied to human BLSS is their biogenic element requirements. Such knowledge is necessary in order to provide optimum mineral nutrition for algae and high productivity, but mainly to maintain these conditions on a specific level during continuous cultivation in the mode of medium recirculation, which requires constant replenishment of biogenic elements in strict accordance with their removal with the collected harvest. Data was obtained on biogenic element requirements of algae during accumulating cultivation under different cultivation conditions. B.W.

N86-15893# Joint Publications Research Service, Arlington, Va.
EAST EUROPE REPORT: SCIENCE AND TECHNOLOGY
9 Oct. 1985 73 p refs Transl. into ENGLISH from various East European articles
(JPRS-ESA-85-031) Avail: NTIS HC A4/MF A01

Progress in science and technology in East European countries is reported. Topics discussed include: German-Soviet joint training of electrical engineers, advanced process for metal glass which failed industrial adaptation, advances in radio biological research; advances in optoelectronic, nuclear reactor, radiobiological research.

N86-15894# Joint Publications Research Service, Arlington, Va.
ADVANCES IN RADIOBIOLOGICAL RESEARCH: HYPOXIC IRRADIATION EFFECTS
A. M. DANCEWICZ and M. M. JELENSKA *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) p 7-13 9 Oct. 1985 refs Transl. into ENGLISH from Nukleonika (Warsaw, Poland), no. 7-8, 1982 p 377-386
Avail: NTIS HC A04/MF A01

The effect of hypoxic conditions during irradiation of rats with 9.0 Gy dose of X-rays determined in lung homogenate concentration of DNA, protein and collagen and the activity of cathepsin, beta-glucuronidase, acid phosphatase and plasminogen activator was studied. It was found that regardless of hypoxic conditions of irradiation, collagen content in rat lungs was increased with time after exposure. Thypoxic conditions resulted in partial decrease during later periods after exposure to other biochemical indices of irradiation. It is evident in the case of the fibrinolytic activity which in hypoxic rats is increased during first several days while in rats irradiated under normal conditions this increase persist for more than 1 year after exposure. E.A.K.

N86-15895# Joint Publications Research Service, Arlington, Va.
TRITIUM INGESTION IN RATS
Z. PIETRZAK-FLIS and I. RADWAN *In its* East Europe Report: Science and Technology (JPRS-ESA-85-031) p 14-25 9 Oct. 1985 refs Transl. into ENGLISH from Nukleonika (Warsaw, Poland), v. 27, no. 7-8, 1982 p 389-403
Avail: NTIS HC A04/MF A01

The effect of chronic ingestion of tritiated water and tritiated food on growth and reproduction of Wistar rats was evaluated. The animals were exposed during one or three successive generations. Ingestion of tritiated food caused higher reduction in sperm count than tritiated water. It is found that the effect of tritium on growth of rats and ability for sperm production depends on the absorbed dose and the form of ingested tritium. E.A.K.

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-16753
HYPOXIC AND HYPERCAPNIC SENSITIVITY AS A REFLECTION OF INDIVIDUAL HUMAN REACTIVITY [CHUVSTVITEL'NOST' K GIPOKSICHESKOMU I GIPERKAPNICHESKOMU STIMULU KAK OTRAZHENIE INDIVIDUAL'NOI REAKTIVNOSTI ORGANIZMA CHELOVEKA]
T. V. SEREBROVSKAIA (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Sept.-Oct. 1985, p. 65-69. In Russian. refs

Examinations of 64 boys aged 15 to 17 years showed that individuals having a lower threshold sensitivity to a hypercapnic stimulus and a larger ventilatory response also exhibited higher levels of ventilation and gas exchange at rest. The reaction of the respiratory system to a hypoxic gas mixture at an altitude of 3000 m was also found to be greater in individuals displaying high hypercapnic sensitivity. In addition, hypercapnic sensitivity was positively correlated with muscular exertion, skin sensitivity, and nervous mobility at high altitude. Correlative connections between hypoxic sensitivity and the above reactivity parameters were less marked. It is concluded that sensitivity to a hypercapnic stimulus, being a genetically fixed trait, can be used as a criterion for evaluating the individual reactivity of an organism. I.H.

A86-17351
PRECISION AND ACCURACY OF OCULOCENTRIC DIRECTION FOR TARGETS OF DIFFERENT LUMINANCES
H. E. BEDELL, M. H. JOHNSON, and R. BARBEITO (Houston, University, TX) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 2, Aug. 1985, p. 135-140. refs
(Contract NIH-EY-03694)

The precision and accuracy of specifying oculocentric directions were assessed by successively partitioning an 8.3 deg space in the right field into a series of perceptually equal fractional spaces and then matching each partitioning target's direction in the left field. Three observers performed this task for four target luminances, ranging from 0.04 to 43 cd/sq m. The results show that luminance has virtually no effect on either the precision or accuracy of spatial partitioning; essentially no effect was obtained even when, for one observer, target luminance was reduced to nearly the absolute threshold. These data are interpreted in terms of the role of oculocentric direction in mediating visual behaviors. Author

A86-17918
LIKELIHOOD OF HIGH RATES OF ENERGY DEPOSITION IN THE HUMAN LEGS AT THE ANSI RECOMMENDED 3-30-MHZ RF SAFETY LEVELS
OM. P. GANDHI, I. CHATTERJEE, D. WU, and Y.-G. GU (Utah, University, Salt Lake City) IEEE, Proceedings (ISSN 0018-9219), vol. 73, June 1985, p. 1145-1147. Navy-supported research. refs
(Contract F33615-83-R-0613)

Based on physical measurements, the letter provides estimates of currents in human subjects exposed to ANSI C95.1-1982 recommended safety levels for RF EM fields. It is shown that such fields are likely to result in high SARs in the leg with values as high as 182 W/kg for the frequency band 3-30 MHz. Author

A86-18547
THE EFFECT OF +GZ ACCELERATION ON CARDIAC VOLUMES DETERMINED BY TWO-DIMENSIONAL ECHOCARDIOGRAPHY
T. JENNINGS (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), J. SEAWORTH, D. RATINO, L. TRIPP, L. HOWELL (USAF, Wright-Patterson Medical Center, Wright-Patterson AFB, OH) et al. SAFE Journal, vol. 15, Winter 1985, p. 4-9. refs

A 3.5 MHz transducer and a real-time, two-dimensional scanner are used to record four-chamber apical echocardiographs before, during, and after exposure to +Gz acceleration. Seven subjects were exposed to two acceleration profiles, +Gz ramp with a +1 Gz/10 second onset rate, and +3 Gz for 3 minutes, with and without G-suit inflation. Graphs displaying the hemodynamic changes for the two test conditions are presented. In both test conditions the heart position remains unchanged. At +1 Gz acceleration in the uninflated G-suit a decrease in end-diastolic volume and stroke volume is observed. The inflated G-suit countered this hemodynamic change; however, after 30 sec of +3 Gz acceleration the protective effect of the suit is no longer detected. I.F.

A86-18548
INFLIGHT LOSS OF CONSCIOUSNESS. II
D. C. JOHANSON (U.S. Naval Weapons Center, China Lake, CA) SAFE Journal, vol. 15, Winter 1985, p. 24-27. refs

An aviator's physiological responses to acceleration, which include cardiovascular reflexes maintaining sufficient blood flow, visual impairment, and loss of consciousness, are described; a graph depicting these responses is provided. The training of an aviator, by exposure, to handle the problems of acceleration is examined; the advantages and disadvantages of using an aircraft or a centrifuge are discussed. Centrifuge training permits the determination of a resting tolerance, multiple exposure, videotaping of training, and biofeedback; it proves to be more beneficial than actual aircraft exposure. I.F.

A86-18831
ADDITIONAL PRESSURISATION FOR TREATING NONRESPONDING CASES OF SERIOUS AIR DECOMPRESSION SICKNESS
D. R. LEITCH and R. D. GREEN (Institute of Naval Medicine, Gosport, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1139-1143. refs

Twenty years of decompression sickness (DCS) treatment records are reviewed in order to assess the treatment value of additional oxygen compression to 50 m (6.0 bar) or higher for cases which failed to respond satisfactorily to standard 5-h treatment of oxygen breathing at 18 m (2.8 bar). For cases with continuing strong symptoms of DCS, further compression to 50 m did not alter recovery. Similarly, compression beyond 50 m (to as deep as 76 m) failed to provide a benefit. Hemorrhage, thrombosis, or edema are suspected to be the cause of continuing deterioration in the nonresponding cases. Therefore, the need for maintenance of constant blood volume during hyperbaric oxygen treatment is emphasized. I.S.

A86-18832
THE DESENSITISATION OF CHRONICALLY MOTION SICK AIRCREW IN THE ROYAL AIR FORCE
M. BAGSHAW and J. R. R. STOTT (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1144-1151. refs

The Royal Air Force Motion Sickness (MS) Desensitization Program (DP), in operation since 1966, consists of a ground phase (GPh) and an airborne phase (APh) of treatment. In the GPh, a vertical vibrating platform, operating at 0.3 Hz and 0.4 Hz, has been introduced in 1981 in addition to the standard cross-coupled, sinusoidal linear Gz and angular oscillation. In the APh of the DP, the basic jet trainer has been replaced by a Hunter T7 jet which allows a graded build-up of MS stimuli from straight flight to advanced aerobatics and high-speed, low-level navigation. Both changes have improved the overall success rate, with the flying phase shown to be the most important component of the treatment. Tolerance might be partially lost after a long break in flying, but is regained after a short period of the therapy, indicating that adaptation may be retained for longer periods than was previously suspected. I.S.

A86-18834* National Aeronautics and Space Administration. Johnson (Lyndon B.) Space Center,
ENDOCRINE CORRELATES OF SUSCEPTIBILITY TO MOTION SICKNESS
R. L. KOHL (NASA, Johnson Space Center; Universities Space Research Association, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1158-1165. refs

Motion sickness releases ACTH, epinerphrine, and norepinephrine. The endocrine responses to motion sickness, adaptive responses leading to the resolution of the syndrome, and the way in which antimotion-sickness drugs influence the endocrine responses were studied. Susceptible or insusceptible subjects were administered antimotion-sickness drugs prior to stressful stimulation. Insusceptible subjects displayed more pronounced elevations of ACTH, epinephrine, and norepinephrine after stressful motion. Predrug levels of ACTH were higher in insusceptible subjects (p less than 0.01). Acute blockade of hormone responses to stressful motion or alteration of levels of ACTH by drugs were not correlated with individual susceptibility. No correlation was apparent between epinephrine and ACTH release. These endocrine differences may represent neurochemical markers for susceptibility to motion, stress, or general adaptability, and it may be that the chronic modulation of their levels might be more effective in preventing motion sickness than the acute blockage or stimulation of specific receptors. Author

A86-18835
PLASMA NOREPINEPHRINE, BLOOD PRESSURE AND HEART RATE RESPONSE TO GRADED CHANGE IN BODY POSITION
V. FIORICA (USVA, Medical Center, Muskogee; Tulsa Medical College, OK) and D. C. KEM (Oklahoma, University, Oklahoma City) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1166-1171. refs

The effect of either an abrupt orthostatic postural change (supine to stand) or a graded change in a head-up body position on a tilt table (0, 20, 40, and 80 deg) on the levels of systolic (SBP) and mean (MBP) blood pressure, the heart rate (HR), and plasma norepinephrine (NE) concentrations was studied on 44 human subjects aged 21-41. Neither postular maneuver caused a significant change in either SBP or MBP. On the other hand, both the HR and NE showed significant increases due to the orthostatic maneuver, and both of these parameters responded with linear proportionality to the increasing degree of tilt. A significant correlation between plasma NE and HR was observed during both positional change maneuvers (orthostatic, $r = 0.50$; graded tilt table, $r = 0.80$), indicating that in the conditions of postural change, plasma NE concentrations reflect the activation level of the sympathetic nervous system. I.S.

A86-18836
HEMODYNAMIC RESPONSES TO UPRIGHT TILT AT SEA LEVEL AND HIGH ALTITUDE
C. S. FULCO, A. CYMERMAN, P. B. ROCK, and G. FARESE (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1172-1176. refs

The effect of a head-up tilt (HUT) (13 min at 60 deg, following 16 min in the supine position) was studied in 8 men (age 21.6 yr) at sea level (SL); after 1 h at 4300 m simulated altitude; and at 18, 66, and 114 h during residence at 4300 m altitude (HA). Changes in heart rate (HR), stroke volume (SV), cardiac output (CO), calf blood flow (CBF), blood pressure (BP), total peripheral resistance (TPR), and plasma norepinephrine (NE) were measured to monitor the effects of positional and altitude changes. After transfer from the SL to HA, the supine values of HR, TPR, BP and NE were increased, while the values of SV, CO, and CBF were reduced. The HUT values of HR and mean BP have also increased after 18 h at HA, but the levels of other parameters measured in the HUT position showed little change from the SL values. Thus, with prolonged exposure to HA (66 to 114 h), the SV, CO, TPR, and CBF responses to tilt were reduced. I.S.

A86-18837
IMMERSION COOLING - EFFECT OF CLOTHING AND SKINFOLD THICKNESS
S. A. NUNNELEY (USAF, School of Aerospace Medicine, Brooks AFB, TX), E. H. WISSLER (Texas, University, Austin), and J. R. ALLAN (Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1177-1182. refs

Accidental immersion often involves the threat of death due to hypothermia. Clothing to control heat loss in water is generally selected to minimize bulk while providing the necessary protection. While water temperature, T(W), and possible immersion time are often considered, another relevant variable is the insulation provided by subcutaneous fat. This paper describes the use of a sophisticated computer model to explore the interactions among skinfold thickness (6-20 mm mean weighted value), clothing insulation (0.06-0.23 immersed), and T(W) (0-20 C), in producing critical hypothermia (arterial temperature equal to or less than 34 C). Results indicate that subcutaneous fat strongly affects heat loss even with heavy clothing. Discussion includes examples of the possible use of skinfold data to improve specification of protective clothing for groups and allow special clothing prescription for individuals. Author

A86-18838
EFFECTS OF PSYCHOTROPIC DRUGS ON THERMAL RESPONSES TO RADIOFREQUENCY RADIATION
J. R. JAUCHEM, M. R. FREI, and F. HEINMETS (Technology, Inc., Life Sciences Div.; Trinity University, San Antonio, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1183-1188. refs
(Contract F33615-80-C-0614)

The effect of chiorpromazine (C), amitriptyline (A), and haloperidol (H) on thermal responses in anesthetized rats during three cycles of exposure to 2.8 GHz radiofrequency radiation was investigated by measuring the time required for the colonic temperature to rise from 38.5 to 39.5 C (rise time) during the exposure and return to 38.5 C (recovery time) after exposure was discontinued. In comparison with the untreated and saline-treated animals, the rats injected with C (5 mg/kg) exhibited increased rise time during the radiation exposure and a faster recovery (decreased recovery time). Neither A (10 mg/kg) or H (0.1 mg/kg) affected thermal response. The results indicate that acute adminstration of C can counteract mild hyperthemia during intermittent exposure to radiofrequency radiation. I.S.

A86-18839
ANALYSES OF MAXIMUM CARDIOPULMONARY PERFORMANCE DURING EXPOSURE TO ACUTE HYPOXIA AT SIMULATED ALTITUDE - SEA LEVEL TO 5000 METERS (760-404 MM HG)
H. T. ANDERSEN, E. B. SMELAND, J. O. OWE, and K. MYHRE (Institute of Aviation Medicine, Oslo, Norway) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1192-1197. refs

A86-18844
HYPOXIA-INDUCED VASOPRESSIN RELEASE AND COAGULOPATHY IN A NORMAL SUBJECT
M. ANDREW, H. OBRODOVICH, G. COATES (McMaster University, Hamilton, Canada), G. L. ROBERTSON (Chicago, University, IL), and G. W. GRAY (Defence and Civil Institute of Environmental Medicine, Downsview, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1220-1223. Sponsorship: Medical Research Council of Canada. refs
(Contract MRC-MA-7595)

This case report describes an apparently normal subject who developed marked qualitative and quantitative changes in all components of the factor VIII complex while inhaling an 11 percent oxygen/balance nitrogen gas mixture for 2 h. Blood from fresh venepunctures was drawn at baseline, during and after exposure to hypoxia for the following: a partial thromboplastin time, a prothrombin time, fibrin monomer, factor VIII:C, VIII procoagulant antigen (VIII:CAg); ristocetin cofactor activity (VIIIR:Co); VIII von Willebrand factor (VIII:vWF) multimer pattern; and arginine vasopressin. During hypoxia VIII:C, VIII:CAg, VIIIR:Ag and VIIIR:Co increased 4 to 5 fold; the VIII:vWF multimer pattern showed increasing low molecular weight complexes, fibrin monomer appeared and arginine vasopressin (AVP) levels increased from 5.5 pg/ml to 73.8 pg/ml. These changes are compatible with both the release of the VIIIR:Ag by AVP and protease induced fragmentation of the VIII complex. Author

A86-18845
WEARING CONTACT LENSES IN SPACE SHUTTLE OPERATIONS
L. G. HART Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1224, 1225. refs

More and more mission specialists are being trained to operate in the Space Shuttle and to eventually maintain a permanent station in space. Since up to 48 percent of the general population wears a visual correction of some sort, it is logical to assume that this percentage will also be found in the astronaut population. This paper proposes that the soft contact lens can be worn successfully in the space environment. The contact lens of choice is the continuous-wear soft contact lens which is proving to be quite successful for the general public. These lenses must be fitted at least 6 months before space flight in order to make sure they can be worn successfully. Author

N86-14849# Joint Publications Research Service, Arlington, Va.
HYGENIC ASPECTS OF REGULAR DIET OF FLIGHT PERSONNEL
I. G. POPOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 1-21 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 4-19
Avail: NTIS HC A07

The nutritional approaches to daily meals for the flying personnel while on the ground are discussed from a historical point of view. It is indicated that the nutrition requirements for the chemical composition of the daily diet are related to the physiological norms accepted by the food science in the USSR and other countries at various stages of its development. It is shown that the present-day diets for the flying personnel have a high caloric value. The basic physiological and nutritional requirements for the daily diets are given. E.A.K.

N86-14850# Joint Publications Research Service, Arlington, Va.
METABOLIC DISTINCTIONS OF HUMAN RED BLOOD DURING LONG-TERM SPACEFLIGHTS
A. S. USHAKOV, S. M. IVANOVA, F. I. ATAULLAKHANOV, A. V. PICHUGIN, Y. I. DUBINSKAYA, S. S. BRANTOVA, O. I. LABETSKAYA, V. P. NAYDINA, and A. Y. ZEZEROV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 22-26 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 19-23
Avail: NTIS HC A07

Before and after the 150-day Salyut-7 flight the crewmembers were examined for their red blood cell metabolism: major metabolic pathways (glycolytic and pentosophosphate), erythrocyte resistance, membrance permeability and lipid peroxidation rate. It is indicated that the metabolic and membrane changes are not pathological and can be classified as adaptive. E.A.K.

N86-14851# Joint Publications Research Service, Arlington, Va.
HUMAN BODY BIOMECHANICS AND MOVEMENTS AFTER 120-DAY ANTIORTHOSTATIC HYPOKINESIA
V. M. ZATSIORSKIY, M. G. SIROTA, B. I. PRILUTSKIY, L. M. RAYTSIN, V. N. SELUYANOV, and L. G. CHUGUNOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 27-32 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 23-27
Avail: NTIS HC A07

Data on body parameters (weight and circumference) and walking biomechanics after 120-day head-down tilt are presented. The exposure leads to changes in the antigravitational muscles which are assumed to be caused by relative changes in the fat and muscle components. Head-down tilt produces changes in the kinematic parameters of the walking process, the shape of support reactions, and losses in the walking efficiency. E.A.K.

N86-14852# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL ACTIVITY OF HUMAN SEROTONINERGIC AND HISTAMINERGIC SYSTEMS DURING LONG-TERM ANTIORTHOSTATIC HYPOKINESIA
N. A. DAVYDOVA, Y. Y. GALKINA, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 33-37 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 27-30
Avail: NTIS HC A07

The functional activity of serotonin and histaminergic systems was investigated during 120-day head-down tilt. Serotonin excretion was increased until test day 70 and histamine excretion throughout the entire study. At the final stage of exposure the serotonin content decreased. Return to the normal motor activity stimulated the function of serotonin and histaminergic systems. E.A.K.

N86-14853# Joint Publications Research Service, Arlington, Va.
BODY POSITION DURING HYPOKINESIA, AND FLUID-ELECTROLYTE METABOLISM
V. B. NOSKOV, G. I. KOZYREVSKAYA, B. V. MORUKOV, Y. M. ARTAMASOVA, and L. A. RUSTAMYAN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 38-43 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 31-34
Avail: NTIS HC A07

Two groups of five healthy volunteers each were exposed for 7 days to: (1) group 1 to horizontal bed rest and (2) group 2 to head-down tilt at -6 deg. The effect of body position on fluid-electrolyte metabolism and renal function was determined. During the control period, bed rest and the recovery period the consumption f fluids and mineral substances and their renal

excretion were measured. The typical changes in fluid-electrolyte metabolism during head-down tilt developed faster than during horizontal bed rest. The fluid-electrolyte balance became negative in the course of the exposure and returned to normal during the recovery period. The group 2 subjects showed greater body weight losses due to both fluid and muscle mass losses. E.A.K.

N86-14854# Joint Publications Research Service, Arlington, Va.
MICROCIRCULATION AND CELLULAR HEMOSTASIS IN MEN WITH BORDERLINE ARTERIAL HYPERTENSION SUBMITTED TO NEUTRAL-TEMPERATURE DRY IMMERSION IN WATER
L. L. KIRICHENKO, V. V. SMIRNOV, and A. G. YEVDOKIMOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 44-49 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 35-38
Avail: NTIS HC A07

Platelet hemostasis, microcirculation, blood viscosity and lipid metabolism were examined in 18 men with borderline hypertension and 8 healthy men before, during and after 7-day immersion. The exposure to thermoneutral dry water immersion produced hypercoagulopathic changes of platelet hemostasis in the healthy and hypertensive subjects. Platelet hemostasis returned to the pretest level in the subjects in 2 days and in the hypertensive subjects in 5 days after exposure. Prior to immersion the hypertensive subjects showed signs of capillarotrophic insufficiency which increased after exposure. On immersion day 3 the hypertensive subjects exhibited a higher blood viscosity and a larger content of total lipids and free fatty acids. E.A.K.

N86-14855# Joint Publications Research Service, Arlington, Va.
EFFECT OF POSITIVE PRESSURE BREATHING ON HEMODYNAMICS IN PATIENTS WITH BORDERLINE HYPERTENSION SUBMITTED TO WATER IMMERSION
V. N. ORLOV, I. O. FOMIN, A. E. RADZEVICH, and G. S. LESKIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 50-53 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 39-41
Avail: NTIS HC A07

Patients with borderline hypertension were exposed, during immersion, to positive pressure breathing. During exposure cardiac output (CO), heart rate (HR), mean arterial pressure (MAP), total peripheral resistance (TPR), left ventricle work (W), blood content of head vessels (Qh), upper and lower lung lobes (Qul and Qll), liver (Ql) were measured. During immersion, CO and MAP decreased, HR and TPR increased slightly, and W diminished. Simultaneously, Qh, Qul and Qll increased significantly while Ql decreased considerably, indicating blood centralization during simulated microgravity. Courses of positive pressure breathing led to decreases in Qh, Qul, Qll and increase in Ql, i.e., they caused blood to be displaced from the head and lungs to the liver. It is concluded that the liver plays the role of a physiological pool which accumulates blood removed from the upper body by positive pressure. E.A.K.

N86-14859# Joint Publications Research Service, Arlington, Va.
HEMODYNAMIC PARAMETERS AS RELATED TO DIFFERENT TOLERANCE TO HEAD-PELVIS ACCELERATIONS
N. I. KOKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 75-80 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 56-60
Avail: NTIS HC A07

Hemodynamic parameters in the subjects with various resistance to +Gz acceleration were investigated. The acceleration value was increased slowly. During centrifugation ECG, systolic pressure in the ear lobe, stroke volume and cardiac output were measured. In the resistant subjects stroke volume remained stable and cardiac output was close to or higher than the initial level. In the nonresistant subjects both parameters decreased although their heartrate was significantly higher than in the resistant subjects. Various visual disorders developed when cardiac output decreased by 50 to 70% as compared to the initial level. It is concluded that in the nonresistant peopel the compensatory mechanisms responsible for the stability of cardiac output include primarily HR increase, whereas in the resistant people they involve a high level of venous return and stroke volume. E.A.K.

N86-14860# Joint Publications Research Service, Arlington, Va.
CHANGES IN PHYSICOCHEMICAL PROPERTIES OF CONTRACTILE AND REGULATORY PROTEINS IN DIFFERENT TYPES OF MUSCLES DURING AND AFTER EXPOSURE TO ACCELERATIONS
B. A. TIKUNOV, M. A. KAYFADZHYAN, and S. S. OGANESYAN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 81-86 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 60-64
Avail: NTIS HC A07

After 15-day exposure to +5 Gx the rate of superprecipitation, Mg2+-ATPase activity and actomyosin ATPase of slow muscles of white rats increased greatly. In actomyosin of fast muscles the exposure induced weaker and opposite changes in the superprecipitation rate and Mg+2-ATPase activity. The changes in actomyosin of the fast muscles were associated with shifts only in regulatory components while those of the slow muscle were produced by shifts in contractile proteins as well. This provided for a better recovery of the initial value of the superprecipitation rate and Mg+2-ATPase activity of actomyosin of the fast muscles a month after exposure. E.A.K.

N86-14861# Joint Publications Research Service, Arlington, Va.
CUMULATIVE EFFECT OF CORIOLIS ACCELERATIONS ON CORONARY HEMODYNAMICS
E. V. LAPAYEV and V. S. BEDNENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 87-92 25 Nov 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 64-68
Avail: NTIS HC A07

Time-course variations in coronary circulation and cardiac output were measured in 29 healthy test subjects who performed tests with a continuous cumulation of Coriolis accelerations and in 12 healthy test subjects who were exposed to Coriolis accelerations combined with acute hypoxia. Adaptive changes in coronary circulation were seen. It is recommended to monitor coronary circulation during vestibulometric tests as part of medical examination of flying personnel. E.A.K.

N86-14862# Joint Publications Research Service, Arlington, Va.
NYSTAGMUS AS RELATED TO UTRICULAR FUNCTION
Y. K. STOLBKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 93-98 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 68-72
Avail: NTIS HC A07

The horizontal neck nystagmus arising in response to angular acceleration as recorded electromyographically in pigeons. After bilateral section of the utricular nerves (Ramuli utriculi) the nygstagmic reactions to the right and to the left remained symmetrical although they were delayed when compared to the reactions of intact animals. Unilateral section of the utricular nerves caused asymmetric reactions from the semi-circular canals; the nystagmus toward the dissected nerve was delayed to a greater extent than that toward the intact nerve. E.A.K.

N86-14863# Joint Publications Research Service, Arlington, Va.
INDIVIDUAL DIFFERENCES IN MAXIMUM OXYGEN UPTAKE REGULATION AND LEVEL
V. S. GOROZHANIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 99-105 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 72-77
Avail: NTIS HC A07

Neuronal and hormonal mechanisms responsible for the differences in the maximum oxygen consumption are discussed. The subjects with electroencephalographic and sensory signs of stimulating reticular-hypothalamic-amugdalic effects balanced with inhibitory cortical-striatic-septic-hippocampal-epiphyseal effects showed a high oxygen consumption, moderate excretion of epinephrine and norepinephrine, moderate plasma concentrations of ACTH, cortisol, total and free 11-OHCS and insulin, relatively high concentrations of STH, and specific dynamics of hormonal and metabolic reactions to aerobic effects. They included a moderate increase of the excretion of dopamine, DOPA and plasma concentrations of ACTH, a comparatively stable level of cortisol, total and free 11-OHCS, drastic increases of norepinephrine excretion and STH, lactate and pyruvate concentrations, a moderate decrease of insulin and pH levels. The subjects with high hypothalamic-reticular-amygdalic effects exhibited an opposite type of endocrine activity and time-course variations of hormonal-metabolic parameters, as well as low values of oxygen consumption. E.A.K.

N86-14864# Joint Publications Research Service, Arlington, Va.
SIGNIFICANCE OF VESTIBULAR RECRUITMENT AND DIRECTIONAL DOMINANCE OF NYSTAGMUS IN DIAGNOSTIC TESTS
M. M. LEVASHOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 106-111 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 78-81
Avail: NTIS HC A07

Vestibular recruitment (VR), a phemonenon of impairment of vestibular nystagmus as a proportionate function of force of stimulus, is of diagnostic interest for the pathology of the ear. There is still no generally accepted opinion about the mechanisms of its onset, there is no uniformity of techniques for its detection and quantitative evaluation and terminology. The conceptions of mechanisms and potential relevance of this phenomenon to applied vestibulometry, which was developed on experience with nystagmometric investigations, is presented. E.A.K.

N86-14867# Joint Publications Research Service, Arlington, Va.
AGE-RELATED CHANGES IN ELECTROENCEPHALOGRAMS OF PILOTS
E. MARKS, W. ZUZEVIC, E. DWOREZKI, and M. MAZENZKI *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 120-122 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 85-86
Avail: NTIS HC A07

An age related changes in electroencephalograms of pilots study was conducted in two stages. At the first stage a visual and statistical analysis of 343 EEG of 125 pilots; at the second, pilots of two age groups were screened: the average age of individuals in the first group was 24.7 years and in the 2d group, 43.8 years. Evoked potentials (EP) matched in response to photic stimuli was used. The average age at the start of EEG observation was 25.1 + or - 5.5 years and at the end, 43.6 + or - 4.6 years. Regularity of alpha rhythm on the EEG, mean frequency of basic rhythm, mean amplitude, reaction delay, activation of EEG by hyperventilation and light flashes (stroboscope) correlation between slow waves, frequency and amplitude of basic rhythm, correlation between EEG and clinical parameters are analyzed. A specially developed chart to analyze the EEG and the criteria of Student, Shapiro-Wilke and X2 in statistical processing are used. E.A.K.

N86-14871# Joint Publications Research Service, Arlington, Va.
COMBINED EFFECTS OF STRESSORS ON THE LEVEL OF SPINAL REFLEX ARC STRUCTURES
F. I. FURDUY, S. K. KHAYDARLIU, and L. M. MAMALYGA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, No. 5, September - October 1985 (JPRS-USB-85-007) p 135-140 25 Nov. 1985 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow), v. 19, no. 5, Sep. - Oct. 1985 p 92-95
Avail: NTIS HC A07

Long-term restriction of motor activity alters appreciably the motor analyzer, including the spinal reflex arc which is the peripheral element of the central nervous system in effecting interaction between the body and environment. The initial period of hypokinesia differs appreciably from the subsequent period of adaptation and is associated in animals with the release reaction and occurs in the presence of a marked stress reaction leading to stressed function of the central nervous system and most other systems of the body. Hypoxia is the most frequent companion of hypokinesia, together with other extreme environmental factors. No data concerning the combined effects of various stressors on the level of the spinal reflex arc are available. The morphological and cytochemical changes in cellular structures of spinal cord ganglia (SCG) and motoneurons of the ventrolateral nucleus (VLN) of the spinal cord on the level of the lumbar and cervical spine under the separate and combined effect of stressors are studied. E.A.K.

N86-14872# David Sarnoff Research Center, Princeton, N.J.
PORTABLE DIAGNOSTIC RADIOMETER Final Report, 1 Oct. 1983 - 30 Jun. 1984
Jul. 1985 68 p
(Contract N00014-83-C-0524)
(AD-A157685) Avail: NTIS HC A04/MF A01 CSCL 06E

There exists a need for a portable diagnostic instrument that can noninvasively monitor and display internal body temperatures. This instrument would be extremely important on U.S. Navy ships whose complement does not include the services of competent medical professionals. In this case it would be important to determine whether a particular medical emergency does or does not exist in a patient. This would determine whether the patient should or should not be evacuated to a suitable medical facility for treatment. The instrument would determine, by radiometric means, whether particular organs exhibit an elevated temperature. For example, this may be an aid in the diagnosis of appendicitis or nephritis. The instrument described in this report is a dual-frequency microwave radiometer. The radiometer measures the amount of noise power being radiated from a localized tissue volume on the patient. The amplitude of this noise power over a frequency spectrum determined by the microwave components is proportional to the average temperature of the volume in question. Making this measurement at two separate frequencies can give an indication of the temperature profile over a depth as great as 6 cm. Author (GRA)

N86-14873# Wisconsin Univ., Madison.
PULMONARY ADAPTATION TO HIGH ALTITUDE Semiannual Progress Report, Dec. 1984 - Jun. 1985
J. A. DEMPSEY Jun. 1985 8 p
(Contract DAMD17-82-C-2259; DAMD17-77-C-7006)
(AD-A157694) Avail: NTIS HC A02/MF A01 CSCL 06S

Three major aims of the contract were addressed in the past 6 months: (1) We completed our study of the relationship between hypoxia-induced periodic breathing in sleep and the occurrence of obstructive apnea. (2) The question of respiratory muscle fatigue during exercise in humans was studied in highly fit subjects performing high intensity exercise to exhaustion. (3) We have studied respiratory muscle recruitment during exercise and saw evidence of active expiration even in mild exercise. GRA

N86-14874# National Council on Radiation Protection and Measurements, Bethesda, Md.
STUDIES CONCERNED WITH BASIC RADIATION PROTECTION CRITERIA AND STUDIES CONCERNED WITH GUIDANCE AND INFORMATION
24 Jul. 1985 6 p
(Contract N00014-84-C-0776)
(AD-A158319) Avail: NTIS HC A02/MF A01 CSCL 06R

Scientific Committee 1 is a standing committee of the NCRP charged with the formulation of basic radiation protection criteria. The Committee is actively engaged in the development of a radiation protection system based on risk. The average annual risk of mortality associated with employment in safe industries is being used by the Committee as the guideline for developing recommendations for the maximum annual risk of mortality for occupational radition exposure. Levels of risk associated with external whole body exposure, partial body exposure, internal exposure and the methodology for the summation of these risks are also being addressed by the Committee. The Committee plans to draft four reports over the next few years. These will cover: (1) exposure limits, (2) the philosophical basis of a radiation protection system based on risk, (3) site-specific risk coefficients, and (4) implementation of a radiation protection system based on risk. The report on exposure limits, Recommendations On Exposure Limits, will enter the Council's review process during the summer of 1985. GRA

N86-14875# Army Research Inst. of Environmental Medicine, Natick, Mass.
CIRCULATORY AND THERMOREGULATORY ACTIONS OF HYDRATION DURING EXERCISE-HEAT STRESS
M. N. SAWKA, R. P. FRANCESCONI, and K. B. PANDOLF Aug. 1985 14 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A158440; USARIEM-M36/85) Avail: NTIS HC A02/MF A01 CSCL 06S

During exercise in the heat, sweat output often exceeds water intake resulting in hypohydration. Hypohydration during exercise causes a greater heat storage and reduces endurance in comparison with euhydration levels. The greater heat storage is attributed to a decreased sweating rate as well as decreased cutaneous blood flow. These response decrements are attributed to both plasma hyperosmolality and plasma hypovolemia. In addition, plasma hypovolemia will result in a reduced cardiac output response, relative to euhydration, during exercise-heat stress. Hyperhydration, or body fluid excess, only provides the advantage of delaying the onset of hypohydration. Author (GRA)

N86-14876# School of Aerospace Medicine, Brooks AFB, Tex.
FOODBORNE AND WATERBORNE DISEASE OUTBREAKS. A COMPILATION AND SUBJECTIVE PROFILE Final Report, Jan. 1977 - Jun. 1983
T. V. MURPHY Jul. 1985 26 p
(AD-A158536; USAFSAM-TR-85-28) Avail: NTIS HC A03/MF A01 CSCL 06E

This papar provides the epidemiologic field with a single source of information about many confirmed foodborne and waterborne disease outbreaks for each of five common bacterial etiologies: Staphylococcus aureus, Salmonella, Shigella, Clostridium perfringens, and Vibrio parahaemolyticus. The paper also evaluate traditional methods of outbreak reporting and suggest that an investigator might apply information of past outbreaks to help form an initial, presumptive diagnosis of a most probable etiologic agent in a current outbreak. GRA

N86-14877# Borriston Research Labs, Inc. Temple Hills, Md.
DEVELOPMENT OF VACCINES TO THE MYCOTOXIN T-2 Final Report, 16 May 1983 - 15 Feb. 1985
V. MANOHAR 15 Mar. 1985 16 p
(Contract N00014-83-C-0441)
(AD-A158544; FR-1) Avail: NTIS HC A02/MF A01 CSCL 06E

An ELIAS System to detect and titer antibody to Mycotoxin T-2 was standardized. A new rapid simple method of making T-2 hemisuccinate (T-2-HS) was developed. The merit of the new method over the existing one accounts for its simple, less time-consuming procedure, which can be carried out at room temperature, with as high a yield of 66%. T-2-HS so developed was conjugated to derivatised sepharope-4B beads to make a column to affinity purify the antibody to Mycotoxin T-2. Polyclonal antisera to T-2 toxin was produced by immunizing rats and mice with T-2-HS coupled to KLH, goat antimouse IgG and monoclonal antimouse IgD. Affinity purified antibody to T-2 was employed in immunizing mice for the development of anti-idiotypic antibodies. Initially syngeneic immunization were carried out in Balb/c mice. Protective role anti-T-2 antibodies upon passive transfer, was examined. Both monoclonal and polyclonal antibodies to T-2, were found to neutralize T-2 toxin in vitro. Upon passive transfer to skin intradermally, inhibition of skin necrotization effect due to T-2 toxin was demonstrated, suggesting, role of an effective antidote. Protective immunity to in vivo exposure to T-2 toxin, upon active immunization with T-2-HS was also examined. Skin necrotization effect of T-2 toxin was completely inhibited in immune rats. However, the in vivo effect of Oral T-2 toxin, as measured by leucopenia in actively immunized rats, was not dramatically significant. GRA

N86-14878# Washington Univ., St. Louis, Mo. Dept. of Electrical Engineering.
CELLULAR EFFECTS OF ELECTROMAGNETIC RADIATION Final Technical Report, 1 Feb. - 31 Jul. 1985
W. F. PICKARD 16 Aug. 1985 11 p
(Contract N00014-82-K-0261)
(AD-A158547) Avail: NTIS HC A02/MF A01 CSCL 06R

Giant cells of characean algae were examined for electrophysiological sequelae to acute electromagnetic field irradiation at 10 mW/per sq cm. Carrier frequencies ranged from 50 MHz to 12.4 GHz and a variety of modulation protocols were employed. No effects were detected at this power level. GRA

N86-14879# Naval Health Research Center, San Diego, Calif.
BENZODIAZEPINE ACTIVITY: DAYTIME EFFECTS AND THE SLEEP EEG Interim Report, Sep. 1978 - Jun. 1984
L. C. JOHNSON and C. L. SPINWEBER 22 Aug. 1984 19 p
(AD-A158702; NAVHLTHRSCHC-84-33) Avail: NTIS HC A02/MF A01 CSCL 06O

In this paper we review the effects of benzodiazepine hypnotics on the structure of sleep, arousal threshold during sleep, and the impact of bedtime hypnotic use on next-day performance. We also describe the effects of discontinuation of use of long and short half-life sedative-hypnotics. Results indicate that the half-life of benzodiazepine hypnotics is not the best predictor of next-day performance effects, arousal threshold effects, or the nature of EEG changes during sleep. Other pharmacokinetic properties, such as volume of distribution, must also be considered. Long and short half-life benzodiazepines both may produce a rebound insomnia, although the time of occurrence seems to differ. The marked individual differences in response to similiar drug plasma levels plus processes of tolerance and adaptation limit the probability that significant correlations during chronic use. Dose level is the best predictor of next-day effects, and so, the smallest effective dose should be described. GRA

N86-14880# Behavioral Research Associates, West Lafayette, Ind.,
BIOCYBERNETIC ANALYSIS OF A HYBRID WORKLOAD MODEL Final Report, 30 Sep. 1984 - 30 Mar. 1985 on Phase 1
B. H. KANTOWITZ May 1985 40 p
(Contract F49620-84-C-0116)
(AD-A159033; BRA-85-10; AFOSR-85-0661TR) Avail: NTIS HC A03/MF A01 CSCL 05J

Biocybernetic measures - heart rate inter-beat interval (IBI) and event-related brain potential (ERP) - were used to provide converging operations to refine a hybrid model of attention and workload. Two experiments using the psychological refractory period paradigm were conducted with stimulus-response uncertainty and inter-stimulus interval (ISI) as manipulations of workload.

Reaction time was influenced by uncertainty and ISI; IBI standard deviation and spectral data were influenced by uncertainty; preliminary analysis of ERP showed N200 amplitude to be influenced by uncertainty and ISI. These results were related to a hybrid processing model formulated by Kantowitz and Knight (1976). GRA

N86-14881# Letterman Army Inst. of Research, San Francisco, Calif.
A MULTI-ISOTOPE PROCEDURE FOR SIMULTANEOUSLY ESTIMATING THE VOLUME OF BODY FLUID COMPARTMENTS OF SWINE Report, for Jan. 1983 - May 1985
C. A. BOSSONE and J. P. HANNON Jun. 1985 64 p
(Contract DA PROJ. 3M1-61102-BS-10)
(AD-A159631; LAIR-201) Avail: NTIS HC A04/MF A01 CSCL 06P

The purpose of the studies reported in this paper was to develop isotope-based procedures to measure plasma volume, red cell volume, extracellular fluid volume, and total body water individually. Subsequently, techniques would be developed to use a combination of these procedures to measure some or all of the fluid spaces in the pig simulaneously. A procedure was developed for simultaneously estimating the volume of all major body fluid compartments. Splenectomized pigs, 20 to 25 kg, with chronically-implanted carotid artery catheters, received a bolus injection (per kg) (1 uCi 125 I-albumin, 11.7 uCi 51Cr-EDTA, 0.6 uCi 22Na, and 5.3 uCi 3H2O) followed by a 5.2 uCi ml/kg injection of 51 Cr-tagged red cells. Estimated lean body mass averaged 822 g/kg and body fat, 178 g/kg. The new procedure was rapid, technically simple, required small amounts of blood and was applicable to conscious animals. GRA

N86-14882# Oak Ridge National Lab., Tenn.
NEUTRON EFFECTS IN HUMANS: PROTECTION CONSIDERATIONS
R. J. FRY 1985 18 p refs Presented at the Workshop on Neutron Therapy: Low Dose Rate and Beam Radiation Therapy, Lexington, Ky., 24 Apr. 1985
(Contract DE-AC05-84OR-21400)
(DE85-015047; CONF-850453-2) Avail: NTIS HC A02/MF A01

Committee I of the International Commission on Radiological Protection has recommended that the Quality Factor for neutrons should be changed from 10 to 20. This article is an interesting recount of the tale of Q from the viewpoint of an observer which illustrates many of the problems that the selection of protection standards pose. DOE

N86-14883# Lawrence Livermore National Lab., Calif.
VARIATION IN BASELINE SISTER CHROMATID EXCHANGE FREQUENCIES IN HUMANS
A. V. CARRANO, L. K. ASHWORTH, J. L. MINKLER, and D. H. MOORE, II 18 Jun. 1985 7 p refs Presented at the 4th International Conference on Environmental Mutagens, Stockholm, 24 Jun. 1985
(Contract W-7405-ENG-48)
(DE85-016084; UCRL-92836; CONF-8506137-9) Avail: NTIS HC A02/MF A01

The lymphocyte is a surrogate cell that is routinely used to measure sister chromatid exchange (SCE) frequencies in humans. Our interests have focused on identifying sources of variability in human lymphocyte SCE frequencies, quantifying the magnitude of the variation, and understanding how it might affect the interpretation of data from mutagen-exposed groups. We have measured lymphocyte SCE frequencies in more than 900 blood samples from over 500 individuals. DOE

N86-14884# Fondazione Ugo Bordoni, Rome (Italy).
REDUCTION OF SUBJECTIVE REDUNDANCY IN IMAGE SIGNALS: RESULTS OBTAINED AND RESEARCH TRENDS [RIDUZIONE DI RIDONDANZA SOGGETTIVA NEI SEGNALI DI IMMAGINE: RISULTATI OTTENUTI A LINEAMENTI DI RICERCA FUTURA]
G. DIBLASIO Dec. 1984 35 p refs In ITALIAN
(FUB-24-1984) Avail: NTIS HC A03/MF A01

The structure and the functions of the human visual system are studied in order to improve the compression of image signals without significative quality loss. A rate of up to 100 is considered the long range goal. Filtering structures defined as hypercomplexes are described. These structures give position estimation and velocity vectors of image elements. A model of image contour perception is presented. Other models describing other functions of the visual system are proposed to implement a research program. Author (ESA)

N86-14885# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES Abstracts Only
22 Oct. 1985 82 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-024) Avail: NTIS HC A05/MF A01

U.S.S.R. progress in the biomedical and behavioral sciences is reported. Topics discussed include: aerospace medicine, Agrotechnology; biochemistry; biophysics; biotechnology; ecology; food technology; genetics; human factors; immunology; laser effects; marine mammals; microbiology; general medicine; military medicine; pharmacology and toxicology; physiology; public health; radiation biology and psychology.

N86-14886# Joint Publications Research Service, Arlington, Va.
VOICE ANALYZER FOR EVALUATING PILOT'S CONDITION Abstract Only
S. DVIGANTSEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-024) p 30 22 Oct. 1985 Transl. into ENGLISH from Gudok (Moscow), 15 Aug. 1985 p 4
Avail: NTIS HC A05/MF A01

This article reports on the development of a system called Equipment for Distinguishing Speech-Signal Parameters (SVPRS). The system is intended for monitoring the condition of airplane crews in the course of long flights through voice analysis from radio conversations. The system is capable of evaluating a subject's emotional state on the basis of a single spoken word, it is claimed. The system is being developed by the department of aviation medicine of the State Scientific Research Institute of Civil Aviation, with assistance from the USSR Academy of Sciences' Institute of Higher Nervous Activity and Neurophysiology, and, also, cyberneticists of Leningrad. The system consists of a magnetic memory, audio-signal filters, a frequency analyzer, a minicomputer, and instruments for processing recordings of speech and for input of data into the computer. Work on perfecting the system is said to be continuing. B.W.

N86-14887# Joint Publications Research Service, Arlington, Va.
ALCOHOL EFFECTS ON BRAIN Abstract Only
M. IGNATENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-024) p 54-55 22 Oct. 1985 Transl. into ENGLISH from Pravda (Moscow), 19 Aug. 1985 p 7
Avail: NTIS HC A05/MF A01

The article reports on a physiological adaptation experiment which was being conducted in the Kara-Kumy Desert. A group of 12 subjects was taking part in the experiment. The group consisted of six Ashkhabad residents and six Moscow residents. For the first time, residents of Central Asia who are acclimatized to high temperatures were taking part in such an experiment simultaneously with residents of the central Russian republic who are not accustomed to desert conditions. The Russian and Asian groups' adaptability to desert conditions was compared. This program was

aimed at gaining detailed knowledge of processes which take place in the body from the effect of stress conditions. B.W.

N86-15866# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF STUDYING FLIGHT WORK IN SOVIET AVIATION MEDICINE OF THE 1920'S - 1930'S
V. M. MUNIPOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 1-10 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 4-11
Avail: NTIS HC A08

Multifaceted investigations of the flying work by Soviet aviation medicine in the 1920 to 1930s are described. The early stages of the professional activity that is at present termed ergonomic foundations of the design, manufacture and use of the aircraft are examined. One of the first formulations of the problem of standardization of the human factors is discussed. Author

N86-15871# Joint Publications Research Service, Arlington, Va.
EFFECT OF LEVEL OF PHYSICAL ACTIVITY ON LIPID METABOLISM OF FLIGHT PERSONNEL
V. I. LIBKIND and V. D. VLASOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 40-43 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 29-31
Avail: NTIS HC A08

Lipid metabolism of healthy pilots was investigated and verified by the PWC sub 170 test. Pilots with a lower physical activity showed high levels of cholesterol, triglycerides, total lipids, LDL and low levels of HDL as averaged per group. The PWC sub 170 value and the concentration of lipid fractions in blood were found to be highly correlated, the correlation being nonlinear. The nonlinear regression data suggest that greater physical activity leads to a decrease of the lipid concentration and an increase of the content of high density lipid-protein complexes. Author

N86-15872# Joint Publications Research Service, Arlington, Va.
OXYGENATION AND REGIONAL CIRCULATION IN GINGIVAL MUCOSAL TISSUES UNDER EFFECT OF HEAD-TO-PELVIS (+GZ) ACCELERATIONS
S. I. VOLVACH, Y. A. KOVALENKO, L. I. VORONIN, N. V. ULYATOVSKIY, V. K. GABYSHEV, V. I. NIKIFOROV, and V. V. ARKHIPOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 44-49 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 31-35
Avail: NTIS HC A08

The information content of a new rheopolarographic procedure used to determine the oxygen balance and regional circulation of the gingival mucosa was measured, bearing in mind the applicability of the procedure as an objective index of human tolerance to +Gz acceleration. It was found that the parameters of the oxygen balance and regional circulation of the gingival mucosa were well correlated with blood pressure in the floor of the auricle. In contrast to the traditional methods for assessing tolerance to acceleration, the new procedure provides information about the health condition of the centrifuged subjects on a continuous basis. Variations in the oxygen balance and regional circulation of the gingival mucosa helped to identify compensatory reactions of the cardiovascular system in response to +Gz acceleration. Author

N86-15873# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF SOME ASPECTS OF HUMAN AMINO ACID METABOLISM DURING 120-DAY ANTIORTHOSTATIC HYPOKINESIA
T. F. VLASOVA, Y. B. MIROSHNIKOVA, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 50-53 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 35-38
Avail: NTIS HC A08

The free amino acid pool of blood of man exposed to 120-day head-down tilt (at -4 deg) was examined. Beginning with bed rest day 28 and till the end of the study, the amino acid pool increased. The increase involved most free amino acids which was produced by a decline of anabolic and stimulation of catabolic processes during hypokinesia. Author

N86-15874# Joint Publications Research Service, Arlington, Va.
EFFECT OF 7-DAY IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PRECISION MOVEMENTS
L. S. GRIGORYEVA and I. B. KOZLOVSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 54-59 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 38-42
Avail: NTIS HC A08

Experiments were carried out to study the effect of 7-day immersion hypokinesia on precision movements that included reproduction of a certain isometric strain of leg muscles and angular displacement of the ankle relative to the 90 deg position. Precision disorders were seen in the structure of movements which lost their stereotypic pattern and became fragmentary, transforming into slow approximate movements versus the pattern of preimmersion movements that were of a rapid programmed control type. Precision changes during plantar flexion movements were usually excessive, hypermetric and almost twice longer than preimmersion. The origin of the above precision changes seems to be primarily associated with muscle atonia. At the same time data analysis shows that in nearly 50% of cases the values of precision changes in movements of various types (efforts and displacements) and different directions (plantar and dorsioflexion) were correlated. This is suggestive of common central mechanisms underlying their development. Author

N86-15875# Joint Publications Research Service, Arlington, Va.
EFFECT OF DRY IMMERSION MODEL ON PARAMETERS OF FLUID-ELECTROLYTE METABOLISM, BLOOD PLASMA ALDOSTERONE AND CORTISOL LEVELS IN INDIVIDUALS DIFFERING IN BODY FLUID CONTENT
M. A. YUNUSOV, V. N. ORLOV, and T. V. VINOKHODOVA *In its* USSR Report: Space Biology and Aerospace Medicine Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 60-64 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 42-45
Avail: NTIS HC A08

Experiments were carried out to study the effect of dry immersion on fluid-electrolyte metabolism, aldosterone and cortisol content in 22 test subjects with varying content of water in the organism. It was found that dry immersion produced a diuretic effect and facilitated a higher excretion of electrolytes and a lower aldosterone content. The test subjects with a higher content of water in the organism (16 subjects) exhibited a more distinct and prolonged polyuria. During the recovery period the aldosterone content increased insignificantly and failed to return to the baseline level, in contrast to the subjects with a normal content of water in the organism. Author

N86-15879# Joint Publications Research Service, Arlington, Va.
MAN'S TOLERANCE TO FULMINANT FORM OF HYPOXIC HYPOXIA
A. Y. KATKOV, Y. P. VYAZOVA, R. N. CHABDAROVA, I. S. KRIKUN, and Z. M. KUDRYASHOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 82-86 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 57-60
Avail: NTIS HC A08

Rapidly progressing, or fulminant form of hypoxic hypoxia is among the extreme factors to which one is exposed in case of depressurization of a flight vehicle. It can be simulated by means of breathing with inert gas. The results of testing reactions to fulminant hypoxia elicited by breathing nitrogen are presented in this report. B.W.

N86-15880# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF CATECHOLAMINE METABOLISM AT HIGH ALTITUDES
N. A. DAVYDOVA, Y. A. SENKEVICH, M. B. BELAKOVSKIY, and S. V. SAMRATOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 87-91 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 60-63
Avail: NTIS HC A08

The function of the sympathoadrenal system (SAS) measured with respect to the content of epinephrine and norepinephrine in blood and urine as well as dopamine and DOPA in urine of mountaineers and atheletes nontrained to high altitudes was examined. It was found that the mediator component of the SAS was activated in the athletes and that the adaptive capability of the SAS of the mountaineers was adequately high. Author

N86-15887# Joint Publications Research Service, Arlington, Va.
INFORMATIVENESS OF ECHO SIGNAL IN PULSED ULTRASONOGRAPHY OF THE BRAIN (WITH USE OF MODEL)
L. G. SIMONOV, L. A. ROZENBLYUM, and N. N. BOGDANOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 125-130 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 83-85
Avail: NTIS HC A08

A change in hydrostatic pressure leads to change in intracranial volumetric relationships (IVR) of liquid media, which has a substantial effect on intracranial pressure and blood supply to the brain. As a noninvasive method of assessing IVR, one can use ultrasonic pulsed probing of the walls of the cerebral ventricles. However, because of its low noise immunity and several other factors that affect the amplitude of the echo signal, the reliability of such a method for evaluation of IVR of liquid media is not satisfactory. A method of probing intracranial structures is described in which the ultrasonic pulse penetrates through the frontal bone, passes through the ventricle and is reflected from the stationary occipital bone. A model was developed to determine the informativeness of an echo obtained in this manner. It was demonstrated on this model that a change in level of the echo signal is elicited by change in ventricular volume. The base width of the ventricle causes this to be a monotone function. It was shown that such a probing method is less sensitive to change in acoustic properties of brain tissue than ultrasonic methods involving direct probing of ventricular walls. B.W.

N86-15888# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF POSSIBILITY OF USING TWO-FREQUENCY IMPEDOMETRY FOR ESTIMATION OF PROPORTION OF TOTAL AND EXTRACELLULAR BODY FLUIDS
V. P. KROTOV, Y. G. BAZUNOVA, and B. S. KULAYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 131-136 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 86-89
Avail: NTIS HC A08

According to the results of postflight examination of cosmonauts, exposure to weightlessness leads to changes in fluid-electrolyte metabolism and in ratio between liquid phases of the body. It is not possible to establish the kinetics of fluid redistribution in the body as a function of duration of weightlessness, since a method has not yet been found that would permit measurement of body fluids and proportion of each in flight. Recently, works have been published, which report that it is possible to determine the ratio of total body fluid to its extracellular component. This is done by concurrently determination of impedance (Z) in the measured section of the body during passage of current through it at different frequencies. However, all of the studies cited above have a clinical and physiological orientation, with which it is impossible to determine distinctly the quantitative relationship between total fluid and its extracellular component. The objective in this research is to explore the possibility of using two-frequency impedometry to determine the quantitative ratio between total body fluid and its extracellular component. B.W.

N86-15889# Joint Publications Research Service, Arlington, Va.
AUTOMATIC DETERMINATION OF CARDIAC OUTPUT FROM RHEOGRAM OF THE TRUNK
I. V. SOKOLOVA and L. A. KHRYASHCHEVA *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 137-140 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 89-90
Avail: NTIS HC A08

Depending on the method of recording the trunk rheogram (TRG) and theoretical validation of formulas for subsequent calculations, many rheographic analogues of characteristics of cardiac output are calculated from the amplitude and period of the TRG with use of appropriate multiplicative coefficients. The technical execution of the system for automatic determination of characteristics of cardiac output on the TRG in the form of an algorithm for a computer does not impose restrictions on structure and number of coefficients, and it offers broad research opportunities for studying them in comparison of rheography to other methods. The algorithm for automatic determination of cardiac output features from the TRG is developed in this investigation in the form of a set of programs in the FORTRAN-IV algorithmic language for YeS or SM series computers, and it solves the following problems: (1) isolation of rheowave as the valid signal in the presence of interference, (2) identification of elements in the rheowave structure for the duration of the cardiac cycle, (3) calculation of rheographic characteristics of cardiac output for the cardiac cycle, and (4) statistical averaging of rheographic characteristics of cardiac output in a specified interval for a specified level of significance. B.W.

N86-15890# Joint Publications Research Service, Arlington, Va.
FUNCTIONAL STATE OF THE OLFACTORY ANALYZER IN A PRESSURIZED ENVIRONMENT
S. S. PASHIN and G. I. SOLOMIN *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 141-144 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 90-92
Avail: NTIS HC A08

Man's long-term presence in pressurized environments (PE) imposes certain requirements of the composition of the artificial atmosphere in space vehicles. It is important for there to be no

odors of various impurities. The latter is attributable to the range of reflex effects of chemicals through receptors of the upper respiratory tract on other analyzers, functional state of the central nervous system, various organs, systems and the body as a whole. It is particularly undesirable to have persistent odorous stimuli in the atmosphere of a pressurized environment, and for this reason odorimetric studies are a mandatory stage of setting hygienic standards. However, such studies are performed under ordinary laboratory conditions, without consideration of the possible functional changes in the olfactory analyzer related to long-term isolation of an individual. An attempt was made in this research to demonstrate any possible functional changes in the olfactory analyzer during long-term exposure of man to the artificial atmosphere of a pressurized chamber. B.W.

N86-15891# Joint Publications Research Service, Arlington, Va.
GAS CHROMATOGRAPHIC ANALYSIS OF FREE FATTY ACIDS OF SKIN SURFACE LIPIDS
V. P. MAYDINA, B. L. AVETISYANTS, and D. M. DUBININ *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 145-148 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 93-94
Avail: NTIS HC A08

The basic components of sebaceous gland secretions are triglycerides, which are hydrolyzed to free fatty acids, monoglycerides and diglycericdes on the skin surface, under the effect of lipases of microorganisms and other factors. Studies of the microflora of the skin surface revealed that it contains aerobic staphylococci, anaerobic propionobacteria and fungi which have lypolytic activity. A correlation was establishment between quantity of microorganisms of the micrococcus family and acne propionobactria on the skin, on the one hand, and rate of formation of free fatty acids (FFA) of sebum cutneum, on the other band. The bactericidal and fungicidal properties of the skin are attributed to the presence of FFA on its surface. The authors of hypotheses on the pathogenesis of acne simplex believe that inflammation of the follicular wall of a sebaceous gland is related to the irritating effect of FFA. Because of the high sensitivity and informativeness of gas chromatography, it has gained wide use in the last 10 years in biomedical investigations. The objective here was to develop a gas chromatography method for examining the FFA of sebum cutaneum. B.W.

N86-15897 Department of the Army, Washington, D. C.
ANTI-TRYPANOSOMAL ACTIVITY OF PLATINUM COORDINATION COMPOUNDS Patent
M. S. WYSOR and L. A. ZWELLING, inventors (to Army) 30 Jul. 1985 4 p
(AD-D011860; US-PATENT-4,532,122;
US-PATENT-APPL-SN-250991; US-PATENT-CLASS-424-10)
Avail: US Patent and Trademark Office CSCL 06O

A novel method has been developed for improved chemotherapy of animals infected with African trypanosomiais. The method involves the concurrent administration of therapeutically effective amounts of cis-diamminedichloroplatinum (II) and bis-(diethylthiocarbamoyl)disulfide (disulfiram) or diethyl dithiocarbamate to the hydrated animal. Author (GRA)

N86-15898*# Stanford Univ., Calif. Dept. of Psychology.
COMPUTATIONAL MODELS OF HUMAN VISION WITH APPLICATIONS Final Report, Oct. 1985
B. A. WANDELL 12 Sep. 1985 7 p
(Contract NCC2-44)
(NASA-CR-176413; NAS 1.26:176413) Avail: NTIS HC A02/MF A01 CSCL 06P

Perceptual problems in aeronautics were studied. The mechanism by which color constancy is achieved in human vision was examined. A computable algorithm was developed to model the arrangement of retinal cones in spatial vision. The spatial frequency spectra are similar to the spectra of actual cone mosaics. The Hartley transform as a tool of image processing was evaluated and it is suggested that it could be used in signal processing applications, GR image processing. E.A.K.

N86-15899# Desmatics, Inc., State College, Pa.
STATISTICAL RESEARCH ON PROBLEMS OF BIODYNAMICS Final Report
K. C. BURNS, C. A. MAURO, and D. E. SMITH Jul. 1985 23 p
(Contract N00014-79-C-0128)
(AD-A157993; TR-112-19) Avail: NTIS HC A02/MF A01 CSCL 06S

The statistical research conducted focused on two major problem areas within the Navy's biodynamics program at NBDL. Those were: (1) impact acceleration injury, and (2) ship motion sickness. Additional research was conducted in the area of performance testing, which is relevant to both of the primary research topics. The following sections briefly summarize the research accomplished under this contract and provide a reference list of all technical reports (with abstracts), journal articles, and presentations resulting from this research effort. GRA

N86-15900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
THE MIDDLE LATENCY RESPONSE (MLR) AND STEADY STATE EVOKED POTENTIAL (SSEP) IN NEONATES Ph.D. Thesis
R. C. FIFER May 1985 180 p
(AD-A158007; AFIT/CI/NR-85-100D) Avail: NTIS HC A09/MF A01 CSCL 06P

This study evaluated the characteristics of the middle latency response (MLR) and the related steady state evoked potential (SSEP) in a total of 36 neonates. The reports of previous investigators have cast doubt on the existence of both the MLR and SSEP in neonates. The measurements in these studies were obtained, however, using stimulation and recording parameters that are appropriate for adults. Since virtually all other aspects of neonate audition differ significantly from comparable adult attributes, one goal of this study was to determine the appropriate parameters with which to obtain a valid MLR and SSEP in very young children. Other goals of this study included: (1) evaluation of two different algorithms for low-frequency sensitivity prediction using the SSEP; (2) investigation of the stability of the SSEP over repeated trials; and (3) elucidation of the relationship the neonatal MLR to later occurring auditory evoked potentials. GRA

N86-15901# Maryland Univ., College Park.
BINOCULAR IMAGE FLOWS: STEPS TOWARD STEREO - MOTION FUSION
A. M. WAXMAN and J. H. DUNCAN May 1985 60 p
(Contract DAAK70-83-K-0018; DE-AC03-84ER-80189)
(AD-A158089; CAR-TR-119; CS-TR-1494) Avail: NTIS HC A04/MF A01 CSCL 06P

In decomposing the visual information processing task into several stages, it is the intermediate level which is responsible for the recovery of surface shapes in a scene. It is often described as a set of shape from modules which, acting independently and in parallel, feed a viewer centered 2.5-D sketch of the visual field. Two of the most commonly studied and closely related modules are shape from stereo and shape from monocular motion. The analyses of visual data by stereo and motion modules have typically been treated as separate, parallel processes which both feed a common viewer-centered 2.5-D sketch of the scene. When acting separately, stereo and motion analyses are subject to certain inherent difficulties: (1) stereo must resolve a combinatorial correspondence problem and is further complicated by the presence of occluding boundaries; (2) motion analysis involves the solution of nonlinear equations and yields a 3-D interpretation specified up to an undetermined scale factor. This report describes a new module which unifies stereo and motion analysis in a manner in which each helps to overcome the other's shortcomings. One important result is a correlation between relative image flow (i.e., binocular difference flow) and stereo disparity; it points to the importance of the ratio delta/delta, rate of change of disparity delta to disparity delta, and its possible role in establishing stereo

correspondence. Our formulation may reflect the human perception channel probed by Reagan and Beverley (1979). GRA

N86-15902# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
COMPARISON OF THE AIR FORCE FEMALE AND MALE PILOT GROUNDED TIME IN THE AIR FORCE MILITARY AIRLIFT COMMAND M.S. Thesis
J. A. HOLL Jun. 1985 35 p
(AD-A158093; AFIT/CI/NR-85-84T) Avail: NTIS HC A03/MF A01 CSCL 05I

The US Air Force presently has over 200 female pilots, and the numbers are steadily increasing. This thesis is the first step in determining the effect of female pilots on the Air Forces' flying squadrons' efficiency and effectiveness. This protocol will compare the average number of days per year men and women pilots are grounded for medical reasons. The duty not involving flying time or DNIF statistics will be used for the data. There are no known studies indicating there is a significant difference in male/female pilot medial absenteeism rates. If the female DNIF rate is found to be significantly larger than the males, it may indicate an effect on the squadrons readiness abilities. The Military Airlift Command (MAC) is chosen for sampling because a relatively large number of female pilots (96) are assigned to this command. The women will be compared to a representative sample of 288 male pilots also assigned to MAC. AF form 1041, which reports DNIF time to Command Headquarters, will be used to collect the DNIF days from the past year; age, rank, and marital status will also be collected. DNIF rates will be calculated correcting for person/months of observation. The age, rank, and marital status specific rates will also be compared. Author (GRA)

N86-15903# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
TOPICAL HAZARD EVALUATION PROGRAM OF CANDIDATE INSECT REPELLENT AI3-35770 HEXAHYDRO-1-((2-METHYLCYCLOHEXYL) CARBONYL)-1-H-AZEPINE Report, Aug. 1984 - Jun. 1985
R. D. RUSSELL Jun. 1985 10 p
(AD-A158386; USAEHA-75-51-0435-85) Avail: NTIS HC A02/MF A01 CSCL 06T

Topical Hazard Evaluations of USDA Candidate Insect Repellent AI3-35770 were performed using New Zealand White rabbits, albino Hartley guinea pigs, and Sprague Dawley rats. Chemical AI3-35770 produced moderate to severe primary dermal irritation and necrosis in rabbits and guinea pigs. These effects were quantitatively worse in rabbits than in guinea pigs. This compound was moderately toxic to rats when given by the oral route. GRA

N86-15904# Army Research Inst. of Environmental Medicine, Natick, Mass.
HUMAN THERMOREGULATORY RESPONSES TO COLD AIR ARE ALTERED BY REPEATED COLD WATER IMMERSION
A. J. YOUNG, S. R. MUZA, M. N. SAWKA, R. R. GONZALEZ, and K. B. PANDOLF Aug. 1985 30 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A158871; USARIEM-M38/85) Avail: NTIS HC A03/MF A01 CSCL 06S

The effects of repeated cold water immersion on thermoregulatory responses to cold air were studied in seven males. A cold air stress test (CAST) was performed before and after completion of an acclimation program consisting of daily 90-min cold (18 C) water immersion, repeated five times a week for five consecutive weeks. The CAST consisted of resting 30 min in a comfortable (24 C, 30% rh) enviroment followed by 90 min in cold (5 C, 30% rh)air. Pre- and post-acclimation, metabolism (M) increased (P 0.01) by 85% during the first 10 min of CAST, and thereafter rose slowly. After acclimation, M was lower (P 0.02) at 10 min of CAST compared to before, but by 30 min M was the same. Therefore, shivering onset may have been delayed following acclimation. After acclimation, rectal temperature (T subscript re) was lower (P 0.01) before and during CAST, and the drop in T subscript re during CAST was greater (P 0.01) than before. Mean weighted skin temperature (T subscript sk) was lower (P 0.01) following acclimation than before, and acclimation resulted in a larger (P 0.02) T subscript re to T subscript sk gradient. Plasma norepinephrine increased during both CAST (P 0.002), but the increase was larger (P 0.004) following acclimation. These findings suggest that repeated cold water immersion stimulates development of true cold acclimation in man, as opposed to habituation. The cold acclimation produced appears to be of the insulative type. GRA

N86-15905# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
SOME EFFECTS OF ALCOHOL AND SIMULATED ALTITUDE ON COMPLEX PERFORMANCE SCORES AND BREATHANALYZER READINGS
W. E. COLLINS, H. W. MERTENS, and E. A. HIGGINS Jul. 1985 12 p
(AD-A158925; DOT/FAA-AM-85-5) Avail: NTIS HC A02/MF A01 CSCL 06O

This study assessed possible interactive effects of alcohol and a simulated altitude of 12,500 ft. Each of 17 men was trained on the various tasks that comprise the Multiple Task Performance Battery and then performed over a 2-week period in four experimental sessions, viz, ground level (1,300 ft), with and without alcohol, and altitude (12,500 ft), with and without alcohol. Subjects breathed appropriate gas mixtures through oxygen masks at both ground level and high altitude. Subjects performed for 3 hours in the afternoon. Alcohol doses were 2.2 mL of 100-proof vodka per kilogram of body weight mixed with three parts of a selected juice. Each 1-hour test block included five 10-minute performance periods with varying workloads and a 10-minute period for controlled breathanalyzer measurements. Results showed no differential effect of simulated altitude on breathanalyzer readings (peaks averaged .078% at 12,500 ft and .077% at ground level). The best performance occurred at ground level under placebo conditions; the 12,500-ft simulated altitude produced some decrement, for the placebo scores were depressed by altitude. Thus, there was no interactive effect of alcohol and altitude on either breathanalyzer readings or performance scores. However, the general decrement produced by altitude (with or without alcohol) serves to reduce further whatever margin of safety remains in performance skills following alcohol ingestion. Author (GRA)

N86-15906# Northwestern Univ., Evanston, Ill.
ENHANCING VISUAL SENSITIVITY Final Report, 1 Oct. 1983 - 30 Sep. 1984
R. SEKULER 24 May 1985 36 p
(Contract AF-AFOSR-0246-80)
(AD-A158799; AFOSR-85-0663TR) Avail: NTIS HC A03/MF A01 CSCL 05J

This report summarizes the major studies carried out under AFOSR grant 80-0246 from October 1, 1983 through September 30, 1984. During this report period we did coordinated work on two aspects of motion perception. One work unit extended our earlier research on how training affects direction discrimination. These studies give new insights into the physiological locus and character of this particular form of perceptual learning. The second work unit exploited perceptual confusions among motion metamers in order to develop a quantitative model of the mechanisms that underlie human direction perception. The model is built around a small number (n=12) of broadly-tuned directionally-selective mechanisms. This model gives an excellent account of the experiments with motion metamers. Author (GRA)

N86-15907# Dalhousie Univ., Halifax (Nova Scotia).
VISUAL SENSITIVITIES AND DISCRIMINATIONS AND THEIR ROLES IN AVIATION Interim Technical Report, 1 Oct. 1983 - 30 Sep. 1984
D. REGAN 17 Jun. 1985 44 p
(Contract AF-AFOSR-0030-84)
(AD-A158962; AFOSR-85-0639TR) Avail: NTIS HC A03/MF A01 CSCL 05I

This report present four studies. An individual's ability to discriminate small differences in orientation about 5% and 0.5 deg respectively contrasts with the coarse size and orientation selectivity of neurons in the visual cortex of the brain. We report evidence that these fine discriminations are achieved by means of opponent processing: size discrimination is determined by antagonism between neurons that are coarsely selective for size, and orientation discrimination is mediated by neurons that are coarsely selective for orientation. Opponent processing implies that the neurons that determine detection are not the neurons that determine fine discrimination: we have experimentally verified that prediction. We have measured motion discrimination in pilots and attempted to predict flying performance in simulators and telemetry-tracked aircraft. Correlations between laboratory tests and flying performance were encouraging, and were much stronger than for simple visual sensitivities such as motion on contrast sensitivity. Some objects are invisible unless they move relative to the background, for example, a grassy hillock viewed against grass in nap of the earth helicopter flight. We have compared human visual sensitivity to such objects, with sensitivity to conventional objects defined by brightness difference. Spatial summation area, and temporal summation area are much larger for motion-defined objects than for brightness-defined objects. We report evidence that the Vector Analysis technique of mathematics may be relevant to the physiological study of visual cues in guided self-motion. GRA

N86-15908# North Carolina Univ., Chapel Hill. Center for Stochastic Processes.
STOCHASTIC DIFFERENTIAL EQUATIONS FOR NEURONAL BEHAVIOR
S. K. CHRISTENSEN and G. KALLIANPUR Jun. 1985 44 p
(Contract F49620-82-C-0009)
(AD-A159099; TR-103; AFOSR-85-0706TR) Avail: NTIS HC A03/MF A01 CSCL 06P

This article extends the recent work of Kallianpur and Wolpert modeling the behavior of neurons by means of stochastic partial differential equations on the dual of a nuclear space. The extensions will cover nuclear spaces of a more general structure and will apply to models described in terms of more general differential operators. A second objective of this article is to present a theoretical framework which will include the model recently proposed and heuristically investigated by Wan and Tuckwell. The authors illustrate their approach and its application by giving a rigorous treatment of the Wan and Tuckwell model. But first they briefly describe the neurophysiological context. Author (GRA)

N86-15909# North Dakota State Univ., Fargo. Dept. of Electrical and Electronics Engineering.
APPLICATION OF THE SYSTEM IDENTIFICATION TECHNIQUE TO GOAL-DIRECTED SACCADES Final Report, May 1984 - May 1985
J. D. ENDERLE Jul. 1985 30 p
(Contract F49620-82-C-0035)
(AD-A159102; USAFSAM-TR-85-37) Avail: NTIS HC A03/MF A01 CSCL 06P

System identification techniques were used to estimate muscle forces during horizontal saccadic eye movements in order to better understand the neuronal control strategy. The lateral and medial rectus muscle of each eye was modeled as a parallel combination of an active state tension generator with a viscosity and elastic element, connected to a series elastic element. The eyeball was modeled as a sphere connected to a viscosity and elastic element. The predictions of the model were shown to be in good agreement with the data. The results of extensive analysis did not support the existence of a postulated continuous-time external feedback control mechanism. Analysis of the data, however, did support a time optimal control strategy, a strategy which directs the eyeball to its destination in minimum time to saccades of all sizes. GRA

N86-15910# Naval Health Research Center, San Diego, Calif.
A COMPARISON OF THE EFFECTS OF CIRCUIT WEIGHT TRAINING ON MEN AND WOMEN Interim Report
E. J. MARCINIK, J. A. HODGDON, J. J. OBRIEN, and K. MITTLEMAN Jun. 1985 17 p
(Contract M00-96-PN)
(AD-A159419; NAVHLTHRSCHC-85-13) Avail: NTIS HC A02/MF A01 CSCL 06S

Prior to training, women exhibited 52.6% of male upper torso dynamic strength and 56.5% of male lower torso dynamic strength. Both sexes responded in a similar manner to the circuit weight training format. Dynamic muscular strength gains were 13.7% for men and 15.7% women. Stamina and all indices of relative body composition were unaffected by training. It can be concluded that circuit weight training demonstrates a potential for shipboard application. It results in the muscular strength gains shown to be necessary for shipboard work performance. It also helps to maintain aerobic fitness in a limited space environment. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-16922* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
JUDGMENTS OF NATURAL AND ANOMALOUS TRAJECTORIES IN THE PRESENCE AND ABSENCE OF MOTION
M. K. KAISER (NASA, Ames Research Center, Moffett Field, CA; Michigan, University, Ann Arbor), D. R. PROFFITT, and K. ANDERSON (Virginia, University, Charlottesville) Journal of Experimental Psychology (ISSN 0278-7393), vol. 11, no. 4, 1985, p. 795-803. refs
(Contract NIH-HD-16195)

Three experiments using McCloskey's curved tube problem, in which people are asked to predict the path that a ball takes when it is shot through a tube curved in a 'C' or spiral, are reported. The first experiment compared the perceptual and representational competencies of observers in recognizing the natural trajectory of the ball, and the second examined the competencies of children on this problem. The third experiment attempted to enhance the representational competence of observers by encouraging them to use a mental imagery approach to the problem. The subjects were presented with both on-going events and with static representations of the event. Men performed better than women under both these conditions, a result not attributable to formal instruction in physics. Children showed no gender effect. The use of mental imagery did not enhance performance on the static test. C.D.

A86-17062
SYSTEM DEVELOPED FOR PSYCHOLOGICAL SELECTION OF AT CONTROLLERS
E. N. ZAITSEVA (Scientific, Research, and Experimental Centre for the Automation of Civil Aviation Air Traffic Control, USSR) and V. F. TOKAREV (Ministerstvo Grazhdanskoi Aviatsii, Moscow, USSR) ICAO Bulletin, vol. 40, Oct. 1985, p. 30-33.

An evaluative system is developed for the vocationally important qualities (VIQ) of ATC personnel. A total of 50 psychological and psychophysiological techniques involving the evaluation of questionnaires and laboratory test procedures have been assessed, with the results thus obtained for ATC trainees and controllers being used to evaluate the predictive values of these techniques.

This predictive value assessment led to the identification of 14 highly informative VIQ tests involving 27 indicators. O.C.

A86-17352
NEURAL DYNAMICS OF PERCEPTUAL GROUPING - TEXTURES, BOUNDARIES, AND EMERGENT SEGMENTATIONS
S. GROSSBERG and E. MINGOLLA (Boston University, MA) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 2, Aug. 1985, p. 141-171. refs
(Contract AF-AFOSR-85-0149; DAAG29-85-K-0095)

A variety of perceptual grouping (PG) and segmentation phenomena, including the PG of textured images, randomly defined images, and images built up from periodic scenic elements, were analyzed in the framework of a real-time visual processing theory (VPT). The theory introduces the distinction between a boundary contour system (BCS) and a feature contour system (FCS) to explain paradoxical data concerning brightness, color, and form perception. Implications of the VPT for the process of PG are discussed. Computer simulations of PG are presented which establish the competence of the BCS as a PG system. The properties of the BCS are compared with probabilistic and artificial intelligence models of segmentation. The results suggest a new approach to the design of computer vision systems to provide a universal set of rules for PG of scenic edges, textures, and smoothly shaded regions. I.S.

A86-17772
A RULE-BASED MODEL OF HUMAN PROBLEM-SOLVING BEHAVIOR IN DYNAMIC ENVIRONMENTS
A. KNAEUPER (Forschungsinstitut fuer Antrhropotechnik, Wachtberg-Werthhoven, West Germany) and W. B. ROUSE (Georgia Institute of Technology, Atlanta) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-15, Nov.-Dec. 1985, p. 708-719. refs
(Contract N00014-82-K-0487)

Human problem solving is considered with emphasis on situations involving human-machine interaction in detecting, diagnosing, and compensating for failures in engineering systems. An overall model is presented which considers the breath and robustness of human problem-solving behavior in dynamic environments typical of engineering systems. A realization of the general structrue of this model within a particular rule-based computer program is discussed. In this program the human behavior in controlling a dynamic process is represented by a set of production rules. The selection of appropriate production rules for a given situation is performed by ordering the rules for specific tasks and by a control mechanism. The latter provide a means to access only a small part of the knowledge base at a time in order to derive decisions as opposed to searching the whole knowledge base. This program was applied to model human problem solving in a process control task. Results from comparing model and subject behavior are presented and discussed. Author

A86-17774* Search Technology, Inc., Norcross, Ga.
PLANT - AN EXPERIMENTAL TASK FOR THE STUDY OF HUMAN PROBLEM SOLVING IN PROCESS CONTROL
N. M. MORRIS (Search Technology, Inc., Norcross, GA), W. B. ROUSE, and J. L. FATH (Georgia Institute of Technology, Atlanta) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-15, Nov.-Dec. 1985, p. 792-798. refs
(Contract NAG2-123; NAS2-12048; N00014-82-K-0487)

An experimental tool for the investigation of human problem-solving behavior is introduced. Production Levels and Network Troubleshooting (PLANT) is a computer-based process-control task which may be used to provide opportunities for subjects to control a dynamic system and diagnose, repair, and compensate for system failures. The task is described in detail, and experiments which have been conducted using PLANT are briefly discussed. Author

A86-18548
'ACTIONS NOT AS PLANNED' IN MILITARY AIR-TRAFFIC CONTROL
C. P. LANGAN-FOX and J. A. C. EMPSON (Hull, University, England) Ergonomics (ISSN 0014-0139), vol. 28, Nov. 1985, p. 1509-1521. refs

Observations were made of the errors made by eight air-traffic controllers over two periods each of 2 1/2 hours. Errors were classified using a recently devised classification of motor-program errors (Reason 1979), and all the controllers were observed under three conditions of workload, and performing two ostensibly similar air-traffic tasks. More errors were found with increasing workload, but only in one of the tasks. This was interpreted in terms of the pacing and time stress inherently imposed in that task. The assessment of error incidence seems a good candidate as a nonintrusive measure of workload. Analysis of errors in terms of Reason's typology showed no interaction with any of the other variables. Author

A86-18833
SELF-CONTROL OF PSYCHOPHYSIOLOGIC RESPONSE TO MOTION STRESS USING BIOFEEDBACK TO TREAT SICKNESS
D. R. JONES, R. A. LEVY, L. GARDNER, R. W. MARSH, and J. C. PATTERSON (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 56, Dec. 1985, p. 1152-1157. refs

Investigators of the Neuropsychiatry Branch, Clinical Sciences Division, U.S. Air Force School of Aerospace Medicine (USAFSAM), provided biofeedback-moderated behavioral treatment to 53 fliers grounded for chronic, severe motion sickness, and followed each flier for 2 years after treatment completion. Success was defined as returning to and maintaining satisfactory operational flying status. Of these, 42 fliers (79 percent) met this criterion; three (6 percent) were partially successful, and eight (15 percent) were subsequently grounded for recurrent airsickness. Follow-on studies will investigate psychophysiological mechanisms through which this method of treatment works. Author

N86-14888# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
SKILL ACQUISITION: COMPILATION OF WEAK-METHOD PROBLEM SOLUTIONS Interim Report, Aug. 1984 - Aug. 1985
J. R. ANDERSON 12 Aug. 1985 75 p
(Contract N00014-84-K-0064)
(AD-A158725; TR-85-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 05J

Cognitive skills are encoded by a set of productions, which are organized according to a hierarchical goal structure. People solve problems in new domains by applying weak problem-solving procedures to declarative knowledge they have about this domain. From these initial problem solutions, production rules are compiled which are specific to that domain and that use of the knowledge. Numerous experimental results follow from this conception of skill organization and skill acquisition. These experiments include predictions about transfer among skills, differential improvement on problem types, effects of working memory limitations, and applications to instruction. The theory implies that all variety of skill acquisition, including that typically regarded as inductive, conforms to this characterization. GRA

N86-14889# Old Dominion Univ., Norfolk, Va. Dept. of Psychology.
ASSESSMENT OF VISUOSPATIAL ABILITIES USING COMPLEX COGNITIVE TASKS Final Report, 1 Jun. 1983 - 1 Apr. 1984
G. L. ALLEN Nov. 1984 36 p
(Contract AF-AFOSR-0161-83)
(AD-A158919; AFOSR-85-0665TR) Avail: NTIS HC A03/MF A01 CSCL 05J

Two studies were conducted in separate areas concerned with visuospatial abilities. The first study was designed to examine the effects of type of instruction (verbal versus graphic) and sex of subject on the acquisition of procedural knowledge in a spatial

task. The spatial task employed was a computerized maze learning task, with trials to criterion and errors to criterion serving as dependent variables. Results indicated that graphic instructions led to fewer errors and trials to criterion than did verbal instructions. However, the performance of males was not superior to that of females, and the hypothesized interaction involving type of instruction and sex of subject was not found. Correlations between psychometric measures of cognitive abilities and measures of maze learning were easily interpreted for learning under graphic instructions but were difficult to interpret for learning under verbal instructions. These findings suggested the need for additional research focusing on: (1) replicating the current results, (2) delineating the factors underlying individuals' learning effectiveness under different types of instructions, and (3) examining individuals' awareness of the relationship between learning effectiveness and type of instruction in visuospatial tasks. The second study was designed to determine the relationship between performance on traditional paper-and-pencil tests of spatial abilities and performance on a task required marrospatial cognitive skills.
GRA

N86-14890# SRI International Corp., Menlo Park, Calif. Life Sciences Div.
NEUROPHYSIOLOGICAL BASES OF EVENT-RELATED POTENTIALS Annual Report, 1 May 1984 - 30 Apr. 1985
C. S. REBERT Jun. 1985 64 p Original contains color illustrations
(Contract F49620-82-K-0016)
(AD-A158997; AFOSR-85-0575TR; AR-3) Avail: NTIS HC A04/MF A01 CSCL 06P

In order to more fully understand the physiological and psychological significance of event-related potentials, cortical and subcortical recordings are being obtained from monkeys performing in operant-conditioning tasks. Five cynomolgus monkeys were successfully trained in the cued-reaction time task at SRI International and recordings were obtained in several experimental conditions--tone discrimination, variation of interstimulus interval (ISI) and stimulus proportionality, and administration of atropine. Under some conditions stimulus salience was enhanced, as evidenced by enlarged evoked potentials, when the ISI and stimulus proportionality were altered. The effects of the anticholinergic drug atropine could be attributed to its peripheral effects. Preliminary examination of dynamic intracerebral interactions in one monkey was carried out in collaboration with A. Gevins at the EEG Systems Laboratory, and studies of two monkeys were continued at Stanford in order to study the P300 wave. Five female stump-tailed macaque monkeys were purchased, trained, and implanted and are ready for tone-light pairing and recording.
GRA

N86-14891# Vreuls Research Corp., Thousand Oaks, Calif.
PERFORMANCE MEASUREMENT GUIDELINES FOR RESEARCH Final Report, 15 Mar. 1980 - 30 Sep. 1982
D. VREULS, R. W. OBERMAYER, A. L. WOOLDRIDGE, and M. J. KELLY 13 Jun. 1985 201 p
(Contract F49620-80-C-0058)
(AD-A159055; AFOSR-85-0642TR) Avail: NTIS HC A10/MF A01 CSCL 05I

All three military services are developing automated human performance measurement systems fore aviation training devices and research on human performance. The purpose of this study was to create a set of aircrew-system performance measurement guidelines for research based on a review of current practice, and the measurement experience and technical judgement of the investigators. A subjective analysis of common measurement requirements among flight tasks for all phases of military aviation was conducted. The selection of system state variables would be dictated by the individual research problem, but guidelines for sampling, measure segmentation, and selection of transforms to create measurement were developed for common flight tasks and measurement problems. Performance measurement issues in system design, training, and automated performance measurement system design were discussed. FORTRAN program listings for common transforms and specialized multivariate data analyses for selecting and constructing measurement from empirical data were appended. Use of the illustrated techniques was recommended, as was the need to update these techniques as measurement experience accrues.
GRA

N86-14892# School of Aerospace Medicine, Brooks AFB, Tex.
SYLLOGISTIC REASONING TASKS, A METHODOLOGICAL REVIEW Final Report, Jun. - Aug. 1983
A. NARVAEZ and J. C. MILLER Jul. 1985 33 p
(Contract AF PROJ. 2312)
(AD-A159190; USAFSAM-TR-84-41) Avail: NTIS HC A03/MF A01 CSCL 05J

The syllogism is a system of reasoning that has been both used and investigated in psychology. The syllogism has many components and defining characteristics. Four basic models of form representation (spatial, linguistic, mixed, and algorithmic) used for linear syllogisms are briefly described. Debate concerning the processes that subjects use in solving syllogisms has led to the formulation of process models. It proposed model for linear syllogisms provides a way to break down the stages of syllogistic problem solving in order to predict performance. Many factors have been shown to affect or influence subjects' performance in syllogistic reasoning. Two historical hypotheses concerning sources of error are the atmosphere, or global impression, of the syllogism--and the conversion hypothesis--which emphasizes illicit processes subjects use in solving syllogisms. Other sources of error include figure effects (syllogisms in certain figures are more difficult than others) and personal bias (one's personal beliefs and attitudes influence performance on syllogisms that are emotion laden or of a controversial nature). Formal rules with which to test the validity of categorical syllogisms are proposed as guidelines for syllogism task construction, and suggestions for experimental design are presented.
GRA

N86-14893# Colorado Univ., Boulder. Center for Research on Judgment and Policy.
MOMENT BY MOMENT VARIATION IN THE COGNITIVE ACTIVITY OF EXPERTS
R. M. HAMM Aug. 1985 91 p
(Contract N00014-81-C-0591)
(AD-A159466; AD-E440296; CRJP-257) Avail: NTIS HC A05/MF A01 CSCL 05J

This paper reports the analysis of moment by moment variation in the use of intuitive and analytical cognition by experts engaged in a complex judgement task. Six highway engineers were asked to think aloud while producing formulas that expressed their knowledge of how highway aesthetics, safety, and capacity are determined by sets of relevant factors. Each engineer's statements were measured with multiple indices of the use of intuitive or analytical cognition, thus producing a moment by moment measure of the engineer's cognitive activity. Measures reflecting the rate of alternation between intuition and analysis, as well as linear and nonlinear trends, were derived from this. Differences in these measures due to task topic were found. Two predictions from Cognitive Continuum Theory were supported by the data: (a) the average segment was more analytical on the capacity task than on the aesthetics task, and (b) the rate of alteration between analysis and intuition was faster on the capacity task, which has high standards, than on the aesthetics task. The subtask the engineer was engaged in was also measured over time, and its was found that subjects used different modes of cognitive activity on different subtasks. Finally, it was discovered that the proportion of time the engineer spent doing particular cognitive activities and particular subtasks was related to the production of more accurate formulas.
GRA

N86-14894# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
AN INVESTIGATION OF JUDGMENTS OF CATEGORY FREQUENCY Technical Report, Jul. 1982 - Jun. 1983
J. A. ENGLERT Oct. 1984 47 p
(Contract DA PROJ. 2Q2-62722-A-791)
(AD-A159555; ARI-TR-653) Avail: NTIS HC A03/MF A01
CSCL 05J

Two experiments investigated the kinds of frequency information that people can remember and individual differences in accuracy of reporting frequency. The task involved presenting individual instances of natural categories and requiring subjects to give absolute estimated of the number of times each category had occurred. In the first experiment, the variability of items was manipulated to assess whether subjects base their estimates on a direct memory access or on a retrieval and mental count of individual instances. A second experiment evaluated subject's capability to report category frequency at two levels of conceptual organization and whether the accuracy of either type of judgement was related to learning style. Data from both experiments suggested that frequency is encoded directly with the memory representation for the concept. The second experiment revealed a sensitivity for frequency of both higher and lower categories, although the former were substantially underestimated. Learning style was not related to either frequency judgement task. The observed underestimation of high frequencies implies a need to take this fundamental judgement bias into account when training persons to make frequency judgements as part of analytical tasks such as risk assessment. GRA

N86-14895# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
THEORETICAL AND EXPERIMENTAL ANALYSIS OF PILOT FAILURE DETECTION BEHAVIOR DURING VARIOUS AUTOMATIC APPROACH CONDITIONS
R. C. VANDEGRAAFF and P. H. WEWERINK 29 Apr. 1983 15 p refs Presented at 19th Ann. Conf. on Manual Control, Cambridge, Mass., 23-25 May 1983
(Contract NIVR-1857)
(NLR-MP-83025-U; B8566436; AD-B094280L) Avail: NTIS HC A02/MF A01

Pilots' failure detection performance was investigated in a moving-base flight simulator. The task considered was the monitoring of stabilized automatic approaches. Abnormal conditions (excessive wind shears or system failures) were to be detected on the basis of unacceptable deviations of displayed variables from their normal positions. Four experienced airline pilots participated in the experiment. The independent variables were: failure type (wind shear or system failure), the axis in which the failure occurred (longitudinal or lateral), and the prior probability of failure occurrence (0.2 to 0.8). The dependent variables were detection times and display deviations at the moment of detection. A theoretical analysis based on a model of the human observer and decision maker formulated in terms of linear estimation and classical sequential decision theory was carried out. Model and measurements agree well, although for two subjects failure detection times are larger. Results show that wind shears are detected more slowly than system failures. Author (ESA)

N86-15868# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF FACTORS DETERMINING PILOT'S GEOCENTRIC ORIENTATION
V. V. LAPA, Y. Y. BUKALOV, and N. A. LEMESHCHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 24-30 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 19-23
Avail: NTIS HC A08

The use of a rational (geocentric) method of orientation in flight is determined by the specific content of the conceptual model that develops in the course of lying experience and by the display of the spatial position of perceptive signs of the geocentric system of coordinates. The importance of these factors is confirmed by a shorter time and a lower number of errors made in assessing the spatial position when the display presented signs of the geocentric system of coordinates. These concepts are studied through flight simulation and flight tests. Author

N86-15869# Joint Publications Research Service, Arlington, Va.
EFFECT OF THREAT STRESS ON PSYCHOMOTOR STABILITY OF PILOTS DIFFERING IN ANXIETY LEVEL
J. TERELAK and J. MACIEJCZYK *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 31-34 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 24-26
Avail: NTIS HC A08

The apparent anxiety as a personality factor cannot serve as a differentiating factor in the performance of psychomotor tasks (oculomotor coordination). It is shown that when pilots manifest a higher level of anxiety, performing specific tasks, their physiological expenditures increase. Author

N86-15870# Joint Publications Research Service, Arlington, Va.
USE OF FLIGHT SIMULATORS FOR DEMONSTRATION OF FUNCTIONAL CAPACITIES OF FLIGHT PERSONNEL
V. A. BODROV, A. A. KUPRIYANOV, and V. V. KHARIN *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 35-39 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 26-29
Avail: NTIS HC A08

Psychophysiological parameters of 89 pilots were examined when they performed flight tasks under normal and complicated conditions. The experiments helped to reveal a group of test subjects (11.2%) who had low capabilities and made serious errors. The results obtained suggest that psychophysiological examinations during stimulated professional activity can be recommended as a method to be used for measuring adaptive and compensatory capabilities of pilots undergoing medical expertise. Author

N86-15885# Joint Publications Research Service, Arlington, Va.
ONE ASPECT OF CREW TRAINING
Y. D. KONOVALOV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 114-119 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 77-80
Avail: NTIS HC A08

This paper describes the psychophysical training of crewmembers of flying vehicles who may find it necessary to cross a water boundary or to remain for long in water after emergency splash-down. In order to prevent attacks of fear and panic caused by such frightful things as whirlpools and convulsions, the paper presents data on the nature of turbulent processes in running water and the techniques of overcoming them as well as on the origin of convulsions in swimmers and methods of their alleviation. B.W.

N86-15911# Toronto Univ. (Ontario).
A COMPUTER MODEL OF DRIVER RESPONSE
L. D. REID, W. O. GRAF, and I. A. STODDARD Sep. 1985 153 p refs Sponsored in part by General Motors and Ontario Ministry of Transportation and Communications
(UTIAS-293; ISSN-0082-5255) Avail: NTIS HC A08/MF A01

The development of a digital computer software package designed to allow the user to predict the dynamic computer software package designed to allow the user to predict the dynamic response of a driver/vehicle system to a limited number of roadway scenarios is described. The simulation is restricted to a single vehicle travelling at constant forward speed and does not cover complex multivehicle interactions. When a driving scenario is specified, the program selects a driver model. A simulation program is used to steer the vehicle through the maneuvers necessary to

complete the driving task. In this manner records of steering wheel position and vehicle trajectory are generated. Three driving scenarios are included in the present development: (1) lane tracking along a straight roadway in the presence of disturbances; (2) lane tracking along a winding roadway; and (3) the obstacle avoidance maneuver. They are basically linear differential equations which mimic the driver's steering wheel response under the conditions which hold in each driving scenario. Each module in the analysis package is described. Author

N86-15912# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A COMPUTER MODEL OF CASE-BASED REASONING IN PROBLEM SOLVING: AN INVESTIGATION IN THE DOMAIN OF DISPUTE MEDIATION Ph.D. Thesis
R. L. SIMPSON, JR. Jun. 1985 393 p
(AD-A158097; AFIT/CI/NR-85-81D) Avail: NTIS HC A17/MF A01 CSCL 05J

Rather than approach each problem as a unique event, people often try to solve problems by recalling similar previous experiences as guides to problem solving. This analogical process, which we call case-based reasoning, seems to provide an explanation for the change in problem solving behavior of people over time. This research presents a computer process model of problem solving based on the use of case-based reasoning. The necessary reasoning processes, operational measures of similarity, and memory structures needed for effective storage and retrieval are presented via the specifications for an advisory system called the MEDIATOR, which offers advice on resolving common sense disputes. In this context, issues associated with enabling machines to dynamically adapt their reasoning and automatically recover from failure are discussed. The model of case-based problem solving which has been developed seems to offer promise as an integrated solution for some issues in problem solving, analogical reasoning, and machine learning. GRA

N86-15913# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.
ON LOOKING INTO THE BLACK BOX: PROSPECTS AND LIMITS IN THE SEARCH FOR MENTAL MODELS Technical Report, 1 Jun. 1982 - 31 May 1986
W. B. ROUSE and N. M. MORRIS May 1985 81 p
(Contract N00014-82-K-0487)
(AD-A159080; GIT-TR-85-2) Avail: NTIS HC A05/MF A01 CSCL 05J

The notion that humans have mental models of the systems with which they interact is a ubiquitous construct in many domains of study. This paper reviews the ways in which different domains define mental models, characterize the purposes of such models, and attempt to identify the forms, structures, and parameters of models. The resulting distinctions among domains are described in terms of two dimensions: (1) nature of model manipulation, and (2) level of behavioral discretion. A variety of salient issues emerge, including accessibility of mental models, forms and content of representation, nature of expertise, cue utilization, and, of most importance, instructional issues. Prospects for dealing with these issues are considered, as well as fundamental limits to identifying or capturing humans true mental models. GRA

N86-15914# Tennessee Univ., Knoxville.
A GENERAL MODEL FOR THE HOMOGENEOUS CASE OF THE CONTINUOUS RESPONSE Research Report
F. SAMEJIMA 31 Dec. 1983 125 p
(Contract N00014-81-C-0569; DA PROJ. RR0-4204)
(AD-A159345; AD-F630701; RR-83-3-ONR) Avail: NTIS HC A06/MF A01 CSCL 12A

A general model for the homogeneous case of the continuous response is proposed. The model is an expansion and generalization of the one proposed by the author in 1974, in which the open response situation is dealt with. In this generalized model, we deal with the closed response situation, and it includes the model for the open response situation as a special case. It also includes models for the open/closed and the closed/open response situations as two special cases. The distinction among the four response situations depends upon the probability assigned to each of the two extreme values of the continuous response, i.e., the probability zero corresponds to the word open, and non-zero to closed. Some examples are given. GRA

N86-15915# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Hamburg (West Germany). Abteilung Flugphysiologie und Psychologie.
EXPERIENCE AND PERFORMANCE IN VIDEO GAMES AND ITS INFLUENCE ON APTITUDE TESTS IN AVIATION PSYCHOLOGY
K. M. GOETERS and B. LORENZ Jul. 1985 47 p refs In GERMAN; ENGLISH summary
(DFVLR-FB-85-43; ISSN-0171-1342) Avail: NTIS HC A03/MF A01; DFVLR, Cologne DM 16.50

A method of evaluation of computer video games was used to analyze the relevance of video games for operational aptitude training in aviation psychology and their effects. A video game was used to test visual reaction under increased concentration strain, resistance to mental distraction, spatial orientation, and psychomotor coordination of air traffic controller applicants. Preexperience and performance with the game; preexperience and personality structure and interest; and the relationship between preexperience and performance tests were studied. Preexperience can influence performance with the game and the capacity structure. Preexperience with video games gives advantages to applicants in aviation psychology aptitude tests. Video games constitute a major psychomotor component in evaluation.
Author (ESA)

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-17320
HUMAN ROLES IN FUTURE SPACE SYSTEMS
H. L. WOLBERS (McDonnell Douglas Astronautics Co., Huntington Beach, CA) IN: Permanent presence - Making it work; Proceedings of the Twenty-second Goddard Memorial Symposium, Greenbelt, MD, March 15, 16, 1984 . San Diego, CA, Univelt, Inc., 1985, p. 57-69. refs
(AAS PAPER 84-117)

U.S. and Soviet space programs to date have graphically demonstrated the value of humans working in space. The point at issue is to determine where, along the continuum from direct manual intervention to completely automated operations, the mission requirements of future space programs can best be met. The criteria of performance, cost, and risk (mission success probability) are suggested as the principal factors by which program or project managers and systems engineers should select the most effective approach to meeting specific mission objectives. Examples of the application of these criteria are presented.
Author

A86-17602#
ENVIRONMENTAL MANAGEMENT OF PAYLOAD PROCESSING FACILITIES
F. B. WENKSTERN (McDonnell Douglas Astronautics Co., Cocoa Beach, FL) AIAA, Shuttle Environment and Operations Conference, 2nd, Houston, TX, Nov. 13-15, 1985. 7 p. refs
(AIAA PAPER 85-6067)

Space Transportation System (STS) Orbiters and Payloads require environmentally controlled facilities for prelaunch testing and integration activities. John F. Kennedy Space Center (KSC) Cargo processing facilities are controlled by a KSC Cargo Facility

Contamination Control Plan. This plan addresses the four mandatory elements for environmentally controlled facilities: environmental monitoring, visual inspection, work rules, and operational controls. The KSC environmental program implements the plan and seeks to define and quantify the various levels of the four elements necessary to achieve required levels of cleanliness. Details of the program are presented to provide an understanding of contamination control at KSC in terms of processing facility capability. Author

A86-17771* Search Technology, Inc., Norcross, Ga.
THE EFFECTS OF TYPE OF KNOWLEDGE UPON HUMAN PROBLEM SOLVING IN A PROCESS CONTROL TASK
N. M. MORRIS (Search Technology, Inc., Norcross, GA) and W. B. ROUSE (Georgia Institute of Technology, Atlanta) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-15, Nov.-Dec. 1985, p. 698-707. refs
(Contract NAG2-123)

The question of what the operator of a dynamic system needs to know was investigated in an experiment using PLANT, a simulation of a generic dynamic production process. Knowledge of PLANT was manipulated via different types of instruction, so that four different groups were created: (1) minimal instructions only; (2) minimal instructions and guidelines for operation (procedures); (3) minimal instructions and dynamic relationships (principles); and (4) minimal instructions, and procedures, and principles. Subjects controlled PLANT in a variety of situations which required maintaining production while also diagnosing familiar and unfamiliar failures. Despite the fact that these manipulations resulted in differences in subjects' Knowledge, as assessed via a written test at the end of the experiment, instructions had no effect upon achievement of the primary goal of production, or upon subjects' ability to diagnose unfamiliar failures. However, those groups receiving procedures controlled the system in a more stable manner. Possible reasons for the failure to find an effect of principles are presented, and the implications of these results for operator training and aiding are discussed. Author

A86-18541* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOTS OF THE FUTURE - HUMAN OR COMPUTER?
A. B. CHAMBERS and D. C. NAGEL (NASA, Ames Research Center, Moffett Field, CA) Computer (ISSN 0018-9162), vol. 18, Nov. 1985, p. 74-87. refs

In connection with the occurrence of aircraft accidents and the evolution of the air-travel system, questions arise regarding the computer's potential for making fundamental contributions to improving the safety and reliability of air travel. An important result of an analysis of the causes of aircraft accidents is the conclusion that humans - 'pilots and other personnel' - are implicated in well over half of the accidents which occur. Over 70 percent of the incident reports contain evidence of human error. In addition, almost 75 percent show evidence of an 'information-transfer' problem. Thus, the question arises whether improvements in air safety could be achieved by removing humans from control situations. In an attempt to answer this question, it is important to take into account also certain advantages which humans have in comparison to computers. Attention is given to human error and the effects of technology, the motivation to automate, aircraft automation at the crossroads, the evolution of cockpit automation, and pilot factors. G.R.

A86-18730
SYSTEMS OF EFFICIENT MAN-COMPUTER INTERACTION [SISTEMY EFFEKTIVNOGO VZAIMODEISTVIIA CHELOVEKA I EVM]
F. I. RYBAKOV Moscow, Izdatel'stvo Radio i Sviaz', 1985, 200 p. In Russian. refs

Methods and facilities of man-computer interaction are analyzed and classified on the basis of a systems approach. Characteristics and efficiency criteria of interaction systems are examined, and questions of organization and implementation are discussed. The design of efficient functional and support facilities for users in man-computer systems is considered. Particular attention is given to the use of a natural language for communication. B.J.

A86-18731
MUSCLE VIBRATIONS AND MAN-MACHINE SYSTEM DYNAMICS [KOLEBANIIA MYSHTSY I DINAMIKA SISTEMY 'CHELOVEK-MASHINA']
M. V. KHVINGIIA, T. G. TATISHVILI, A. M. BAGDOEVA, and G. G. TSULAIA Tbilisi, Izdatel'stvo Metsniereba, 1984, 88 p. In Russian. refs

The work considers the development of a man-machine system model and the analysis of a nonlinear muscle model under various types of external loads. A skeletal-muscle model is developed which includes (along with the usual motor fibers) modified fibers exceptionally sensitive to tension. In addition, a three-dimensional multimass model of four-arm and two-arm systems is developed which describes the vibrations of the upper extremities. Results are also presented on the stability and vibrations of an athlete's body during the simulation of various types of athletic activity. B.J.

N86-14896# Argonne National Lab., Ill. Computing Services.
THE SCIENTIFIC WORKSTATION EVALUATION PROJECT: MULTIDISCIPLINARY EXPERIENCE WITH A SCIENTIFIC WORKSTATION
R. C. RAFFENETTI, G. BIRGERSSON, R. N. BLOMQUIST, J. M. KENNEDY, D. D. KOELLING, A. J. POLICASTRO, and C. M. CARUTHERS, ed. 10 Dec. 1985 97 p refs
(Contract W-31-109-ENG-38)
(ANL-84-100) Avail: NTIS HC A05/MF A01

The objective of this project has been to evaluate a scientific workstation. A workstation is a dedicated computing system that supplies a fixed quantity of computing resource for its user. A workstation's interactive response and its total throughput are limited by the speeds of various components of the workstation hardware and the operating system software. A forerunner of the scientific workstation is the so-called personal desktop computer, itself a kind of workstation. The architecture of the processors used in personal desktop computers cannot meet the needs of heavy-duty scientific computing work. Semiconductor companies are now striving to implement a generation of 32-bit microprocessors and related circuitry. Out of these efforts have appeared the complete computer systems which are capable of scientific computing. Members of the technical staff were invited to help define minimum configuration and minimum workstation capabilities. After the machine was selected and delivered, it was integrated into the Argonne computing environment. Following this integration, for five months of the six month evaluation period, user evaluators had an opportunity to use the workstation to do their scientific computing. Observations and conclusions are discussed in detail. B.W.

N86-14897# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
HUMAN FACTORS ENGINEERING DESIGN CRITERIA FOR FUTURE SYSTEMS. DESIGN CRITERIA EVOLVING FROM THE FIRE SUPPORT TEAM VEHICLE (FIST-V) OPERATIONAL TEST 2 Research Report, for Period Ending Jan. 1984
L. M. CRUMLEY and W. K. EARL Jan. 1985 26 p
(Contract DA PROJ. 2Q2-63739-A-793)
(AD-A158312; ARI-RP-85-04; R-2) Avail: NTIS HC A03/MF A01
CSCL 19C

Human factors engineering (HFE) design problems reported in the FIST-5 Operational Test 2 were compared with criteria in MIL-STD-1472C and MIL-HDBK-759A to determine criteria adequacy. Where problems occurred and the related current criteria were adequate, it is recommended that greater emphasis be given these criteria in future programs. New criteria are proposed for inadequate or missing criteria. HFE problems were distributed across 27 different equipment components. Current criteria were judged adequate for 25 features and inadequate for 2. Thus, adequate guidance was available in the current FIST-V partly due

to design constraints inherent in the vehicles since the FIST-V is a modification of the M901 Improved TOW Vehicle. GRA

N86-14898# Coast Guard, Washington, D.C. Office of Research and Development.
A COMPARISON OF THE PROTECTION AGAINST IMMERSION HYPOTHERMIA PROVIDED BY VARIOUS TYPES OF COAST GUARD ANTI-EXPOSURE CLOTHING IN CALM VERSUS ROUGH SEAS Final Report
A. M. STEINMAN, M. J. NEMIROFF, J. S. HAYWARD, and P. S. KUBILIS Jun. 1985 86 p
(AD-A158413; USCG-D-17-85) Avail: NTIS HC A05/MF A01 CSCL 06Q

The purpose of this study was to compare the protection against immersion hypothermia provided by various types of Coast Guard Operational clothing to survivors of mishaps in calm versus rough seas. Eight garment ensembles were evaluated: (1) flight suit (control); (2) full wet suit and (3) shorty wet suit (tight-fitting wet garments); (4) aviation antiexposure coveralls; (5) boatcrew antiexposure coveralls, and (6) thermal float coat (loose-fitting wet garments); (7) dry suit; (8) survival suit (dry garments). Mean calm-water temperature was 10.7 C. Rough water mean temperature was 11.1 C. with 4 to 6 foot swells, occasional 4-foot breaks, 2 to 3 foot wind-waves and 0 to 3 knots current. Eight volunteer Coast Guard crewmen wore each garment-ensemble once in each of the two sea conditions. Dependent variables were rectal temperature, groin skin temperature, back skin temperature, heart rate, and subjective evaluations of warmth, tightness of garment fit, and amount of cold water flushing. The results showed signficantly faster mean rectal temperature cooling rates and significantly larger declines in skin temperatures in rough seas than in calm seas for subjects wearing the float coat, aviation anti-exposure coveralls and boatcrew coveralls. Heart rates were significantly faster in rough seas than in calm seas for all garments. Rectal and skin temperature changes were positively correlated with each other and with subjective evaluation of cold water flushing, but they were negatively correlated with warmth and tightness of fit. In general, dry garments provided better protection than did wet garments in both sea conditions, and tight-fitting wet garments provided better protection than did loose-fitting wet garments in rough seas. GRA

N86-14899# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
TEAM PERFORMANCE WITH LARGE AND SMALL SCREEN DISPLAYS
C. E. BROWN and D. G. LEUPP Jun. 1985 20 p
(AD-A158761; AAMRL-TR-85-033) Avail: NTIS HC A02/MF A01 CSCL 05H

Large displays are common in modern command centers, yet the rationale for their use is typically weak. A literature search revealed little previous work comparing performance of teams with large group displays versus individual CRT's. The most applicable previous studies used static tasks and photographic projection systems. The study described here used a complex, dynamic task which required extensive interaction between members of three-person teams to achieve best performance. A comparison was made between the performance of three-person teams viewing either one large screen display or three individual CRT's. Results indicate that display size did not strongly affect team performance, although there were differences in the details of task performance that are attributable to display variables. GRA

N86-14900# Clarke Ambrose, Inc., Knoxville, Tenn.
HUMAN-MACHINE INTERFACE IN MOBILE TELEOPERATORS
J. V. DRAPER 1985 15 p Presented at the Workshop on Requirements of Mobile Teleoperators for Radiological Emergency Response and Recovery, Dallas, 23 Jun. 1985
(Contract DE-AC05-84OR-21400)
(DE85-013639; CONF-8506148-1) Avail: NTIS HC A02/MF A01

Several reasons are given for the importance of human operators. An ideal human teleoperator interface called telepresence is defined. It is concluded that the human machine interface is not ideal, and that it may be improved, and that available and developing technology can improve interfaces. E.R.

N86-14901# Little (Arthur D.), Inc., Cambridge, Mass.
ABRASION-RESISTANT ALUMINIZED-COATED ARAMID FABRICS FOR MANUFACTURE OF FIREFIGHTERS' PROTECTIVE CLOTHING Final Technical Report
R. BRENNEMAN 10 Oct. 1985 71 p
(Contract N00140-83-C-RA12)
(AD-A157056; ADL-88860; NCTRF-160) Avail: NTIS HC A04/MF A01 CSCL 11E

The required yardage of two experimental approaches to developing an abrasion resistant fabric for firefighters protective clothing has been delivered to NCTRF, Natick, Ma, for fabrication into uniforms. The first is an electron-beam (EB) cured coating on the two-side aluminized mylar used in the existing laminated fabric. The second is a one-side aluminized Kapton (K) film laminated metal side to Kevlar fabric. The Kapton product illustrates the principle that a high temperature melting point film, aluminized on one side and laminated metal side down to Kevlar fabric, can provide abrasion and chemical resistance as well as reflectivity. However, its water absorption and adhesive characteristics severely limit use in the water-prone firefighters environment. We believe other high-temperature melting resins, such as polysulfone or polyether-imide, would probably have more suitable adhesive properties than Kapton because they are more water resistant. Both the esperimental EB and Kapton products absorb more heat than the existing product because they reflect less infrared energy than the pure aluminum on the existing product. It is a fundamental fact that only gold metal can be coated on aluminum without reducing its reflectivity of the aluminum. GRA

N86-14946# Rutgers - The State Univ., New Brunswick, N. J. Dept. of Mechanical Industrial and Aerospace Engineering.
APPLICATION OF SCREW CALCULUS TO THE EVALUATION OF MANIPULATOR WORKSPACE
L. M. HSIA and T. W. LEE *In* ARO Transactions of the 2nd Army Conference on Applied Mathematics and Computing p 765-785 Feb. 1985
(AD-P004947) Avail: NTIS HC A99/MF E03 CSCL 12A

In this paper, an analytical technique is presented that is based on screw calculus and dual-number matrices to derive the kinematic equations and the workspace formulations of robotic manipulators. A computational procedure for quantitative evaluation of workspace volume is also developed. Several examples are chosen to demonstrate the usefulness and the effectiveness of the approach. One of the basic problems encountered in manipulator design is the determination of the shape of workspace and its characteristics. The workspace, which is the one of operation of a manipulator, is the space associated with possible positions and orientations of the last link of a manipulator. A knowledge of the workspace of a manipulator can provide a measure of the efficiency of the design. Therefore, the investigation on workspace is a fundamental interest. GRA

N86-15444# Joint Publications Research Service, Arlington, Va.
CNES OF FRANCE RESEARCHES REMOTE CONTROL SYSTEM FOR SPACE
J. M. GUILBERT *In its* West Europe Report: Science and Technology (JPRS-WST-85-015) p 1-4 14 May 1985 Transl. into ENGLISH from Revue Generale de L'Electricite (Paris), Nov. 9814 p 724; 728-729
Avail: NTIS HC A04/MF A01

Mission analysis studies show that the needs for remote control fall into two broad categories: (1) needs for intervention, repair and maintenance; and (2) needs for deployment, assembly and construction. Depending on the missions and on whether the operator is on board the remote-controlling craft or on Earth, the remote-control system will have more or less autonomy of decision. The field of remote-control in space is discussed, as are a few projected or completed systems illustrating the interest of remote control, with or without a man on board. Author

N86-15867# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF DETERMINING HUMAN PHYSICAL WORK CAPACITY UNDER HYPERBARIC CONDITIONS
L. A. BRYANTSEVA and A. Y. MIKHNENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 11-23 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 11-19
Avail: NTIS HC A06

Physical work capacity of man during real and simulated dives is discussed in view of the reported data. The parameter is known to decrease as the breathing gas density and immersion depth increase. The factors limiting the work capacity growth are as follows: greater respiration resistance, higher energy cost of ventilation, CO2 retention, dyspnea, adverse circulation changes. During exposure hyperbaric bradycardia occurs both at rest and upon a work load. This precludes prediction of physical work capacity on the basis of the heart rate alone as a parameter used in a normobaric environment. Tabulated data on the work capacity of divers at various depths obtained by different authors is presented. Author

N86-15886# Joint Publications Research Service, Arlington, Va.
METHOD OF CALCULATING ANGULAR DIMENSIONS OF FLIGHT VEHICLE COCKPIT CANOPY CASINGS
A. V. LEKAREV *In its* USSR Report: Space Biology and Aerospace Medicine, Vol. 19, No. 4, Jul. - Aug. 1985 (JPRS-USB-85-006) p 120-124 4 Nov. 1985 refs Transl. into ENGLISH from Kosmich. Biol. i Aviakosmich. Med. (Moscow), v. 19, no. 4, Jul. - Aug. 1985 p 81-83
Avail: NTIS HC A08

The view from flight vehicle (FV) cockpits is an important factor in assuring flying safety and providing comfortable conditions for the pilot's visual observation of space outside the cockpit. At the present time, transparent parts of most cockpits in different types of FV are executed in the form of flat panels installed into the metal frame of the cockpit canopy. Presence of opaque components (casings) in the cockpit canopy results in obscuring part of the outside area, which worsens viewing conditions from the pilot's work place. In order to improve the view from FV cockpits with flat transparent parts, a method was developed for calculating the angular dimensions of casings (seams) on the basis of distinctions of human binocular vision. The proposed method makes it possible to meet the requirements as to strength features of the canopy frame and provide for comfortable viewing conditions outside the cockpit. The method is based on crossed diplopia in an empirical horopter from a point of the cyclopic eye of the observer. B.W.

N86-15916# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
HUMAN FACTORS ENGINEERING DESIGN CRITERIA FOR FUTURE SYSTEMS. REPORT NUMBER 3: DESIGN CRITERIA EVOLVING FROM THE MULTIPLE MULTIPLE ROCKET SYSTEM (MLRS) OPERATIONAL TEST 3 Research Report, for Period Ending Apr. 1984
W. K. EARL and L. M. CRUMLEY Jan. 1985 36 p
(AD-A158316; ARI-RP-85-05) Avail: NTIS HC A03/MF A01 CSCL 19G

This document compares human factors engineering related problems identified in the U.S. Army Operational Test and Evaluation Agency MLRS Operational Test 3 with relevant criteria statements from MIL-HDBK-759A and MIL-STD-1472C. These criteria were reviewed to determine if they provided adequate guidance for making informed design judgements. Areas where existing criteria are inadequate or nonexistent were identified and new complete criteria developed. The new criteria are presented in a format designed to facilitate their use in the design of future similar systems. GRA

N86-15917# Naval Postgraduate School, Monterey, Calif.
MANAGING COMPUTER SYSTEMS DEVELOPMENT: UNDERSTANDING THE HUMAN AND TECHNOLOGICAL IMPERATIVES M.S. Thesis
G. S. CURTIS Jun. 1985 154 p
(AD-A158976) Avail: NTIS HC A08/MF A01 CSCL 05H

This thesis examines the human and technological issues that are often encountered during the development of modern computer information systems. People and technical constraints, including suggestions for minimizing negative consequences, are illustrated throughout the development life cycle. Special emphasis is placed on strategic planning, end user involvement in the requirements definition phase, and user-oriented software. The research consists of a review of current literature concerning techniques, methods and methodologies that are the basis for managing computer information system development. It is a collection of bits and pieces of wisdom by experts from all disciplines within the computer and managing fields. These techniques can be tailored to various scale projects having myriad objectives. The theory and practice of management methods included in this paper can be applied universally to computer projects. However, the study is directed at all U.S. Navy managers who are, or will be, involved in the transition to modern computer information systems. GRA

55

PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-16417
BOUNDARY STRUCTURES ARE FORMED BY ORGANIC COMPONENTS OF THE MURCHISON CARBONACEOUS CHONDRITE
D. W. DEAMER (California, University, Davis) Nature (ISSN 0028-0836), vol. 317, Oct. 31, 1985, p. 792-794. refs

Boundary structures forming in aqueous phases from nonpolar organic components of carbonaceous chondrites are reported for the first time. The recovery of the nonpolar organic material which formed these structures from the Murchison meteorite is described, and the properties of the material are reported. Two kinds of boundary structures were formed at alkaline pH ranges: microstructures in the form of viscous fluid droplets and thin boundaries capable of acting as a barrier to free diffusion. C.D.

A86-16425
SPIN-DEPENDENT ELECTRON SCATTERING FROM OPTICALLY ACTIVE MOLECULES
D. M. CAMPBELL and P. S. FARAGO (Edinburgh, University, Scotland) Nature (ISSN 0028-0836), vol. 318, Nov. 7, 1985, p. 52, 53. refs

It has been suggested that spin-polarized electrons or positrons emerging in the beta decay of radioactive nuclei may have led to a preferential destruction of one of the two isomers at an early stage of evolution. This process tipped the initial balance of abundance of the two self-replicating isomers, leading to the present isomeric purity of biomolecules. Here, an experiment is described which indicates that spin-polarized electrons, when scattered from optically active molecules, can 'distinguish' between right-handed and left-handed isomers. C.D.

A86-17623
MOLECULAR THEORY OF EVOLUTION: OUTLINE OF A PHYSICO-CHEMICAL THEORY OF THE ORIGIN OF LIFE
B.-O. KUEPPERS (Max-Planck-Institut fuer biophysikalische Chemie, Goettingen, West Germany) Berlin and New York, Springer-Verlag, 1983, 330 p. Translation. refs

The molecular basis of biological information, principles of molecular selection and evolution, the transition from nonliving to living systems, and theoretical models of evolution and the ways

in which they might be tested are considered. Statistical treatment of deterministic and stochastic theories of selection is presented. The information threshold for nucleic acids, information integrating mechanisms, the origin of the genetic code, and self-organization in macromolecular networks are given special consideration. The points of contact between the molecular theory of evolution and the thermodynamic theory of irreversible processes are examined in the framework of thermodynamic principles. Mathematical presentations of the eigenvalue problem, linear stability analysis, and the method of Lagrange multipliers as well as the mathematical relationships involved in stochastic processes are included. I.S.

A86-17740
RADIATION CHEMISTRY OF A MULTICOMPONENT AQUEOUS SYSTEM RELEVANT TO CHEMISTRY OF COMETARY NUCLEI
Z. D. DRAGANIC, S. I. VUJOSEVIC, A. NEGRON-MENDOZA, J. A. AZAMAR, and I. G. DRAGANIC (Universidad Nacional Autonoma de Mexico, Villa Obregon, Mexico) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 2, 1985, p. 175-187. refs

Consequences of irradiation of a water-dominated multicomponent system with large doses (16 to 300 Mrad) of gamma rays from a Co-60 source at 77 and 3210 K were examined. The chemical composition of the 0.2 M HCN/0.12 M CH3OH/0.04 M CH3CN/0.02 M C2H5CN/0.01 M HCOOH system in oxygen-free water was based on the assumptions that comets originated in the outer regions of a primordial nebula and that interstellar compounds are the chemical constituents of the nucleus. Column, paper, and gas chromatography, together with other conventional methods, were used in the analysis of radiology products. At 310 K, about 40 radiolytic products were identified, including some aldehydes, amino acids, and carboxylic acids. Polymeric material with M(w) values of up to 80,000 daltons was separated. At 77 K, the basic radiolysis products were presented, but in lesser quantities (by one to two orders of magnitude). The relevance of the findings to the chemistry of a liquid-water core and the ice layers of a cometary nucleus is discussed, including chemical composition of the nucleus and its temperature regime. I.S.

A86-17807
PARITY-VIOLATING ENERGY DIFFERENCES OF CHIRAL MINERALS AND THE ORIGIN OF BIOMOLECULAR HOMOCHIRALITY
G. E. TRANTER (Oxford University, England) Nature (ISSN 0028-0836), vol. 318, Nov. 14, 1985, p. 172, 173. refs

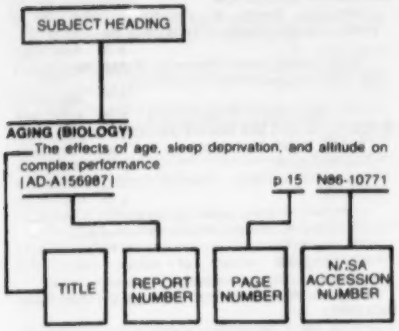
The homochirality in the biochemistry of terrestrial organisms may be a result of very small differences between the electronic energies of enantiomeric prebiotic molecules resulting from the parity-violating weak interactions. The energy differences are, however, so small for simple chiral molecules that the propagation of homochirality would require a dissymmetry amplification mechanism involving both large quantities of reactants and long reaction time. An alternative theory, presented here, suggests that the effects of the parity-violating weak interactions in crystalline enantioselective prebiotic catalysts, such as clay silicates, may require considerably less amplifications. C.D.

A86-19126* Arizona State Univ., Tempe.
AMINO ACIDS OF THE MURCHISON METEORITE. II - FIVE CARBON ACYCLIC PRIMARY BETA-, GAMMA-, AND DELTA-AMINO ALKANOIC ACIDS
J. R. CRONIN, S. PIZZARELLO, and G. U. YUEN (Arizona State University, Tempe) Geochimica et Cosmochimica Acta (ISSN 0016-7037), vol. 49, Nov. 1985, p. 2259-2265. refs
(Contract NSG-7255)

The five-carbon acyclic primary beta, gamma, and delta amino alkanoic acids of the Murchison meteorite are studied using gas chromatography-mass spectrometry and ion exchange chromatography. The chromatograms reveal that alpha is the most abundant monoamino alkanoic acid followed by gamma and beta, and an exponential increase in the amount of amino acid is observed as the carbon number increases in the homologous series. The influence of frictional heating, spontaneous thermal decomposition, and radiation of the synthesis of amino acids is examined. The data obtained support an amino acid synthesis process involving random combination of single-carbon precursors. I.F.

AEROSPACE MEDICINE AND BIOLOGY / *A Continuing Bibliography (Supplement 283)* APRIL 1986

Typical Subject Index Listing



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A

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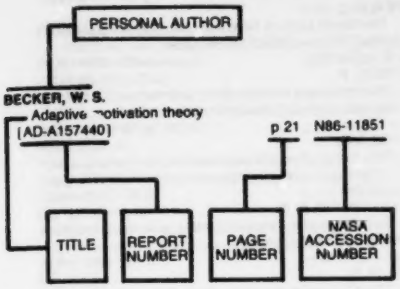

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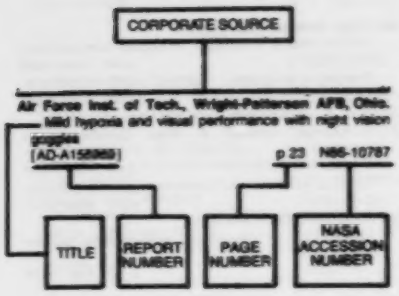

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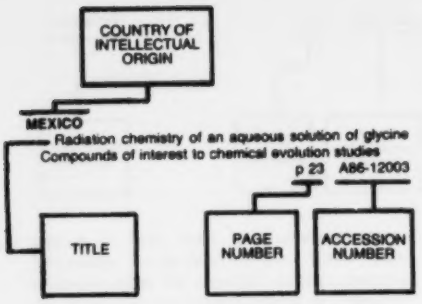

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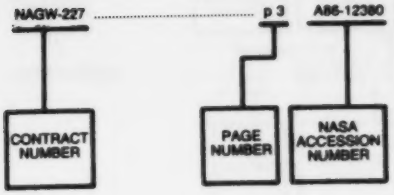

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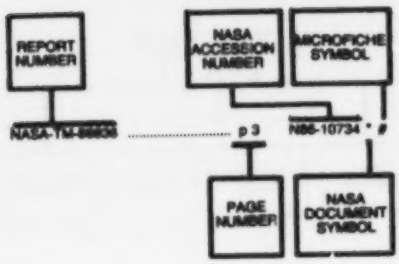

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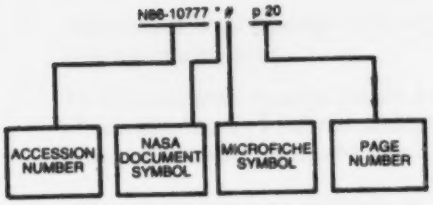

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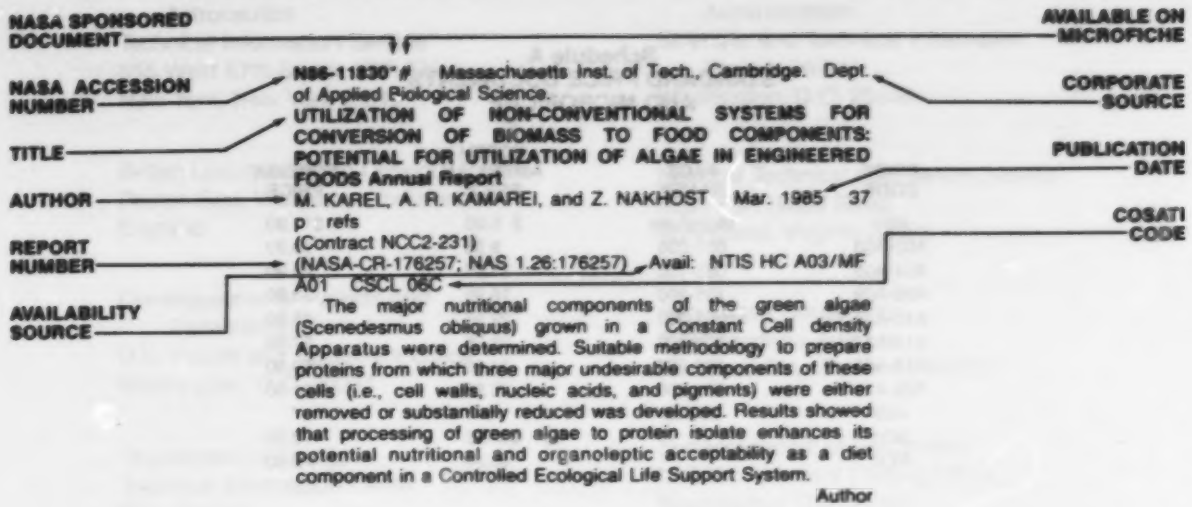
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TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHOR
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
COSATI CODE
REPORT NUMBER
(Contract NCC2-231)
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
AVAILABILITY SOURCE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
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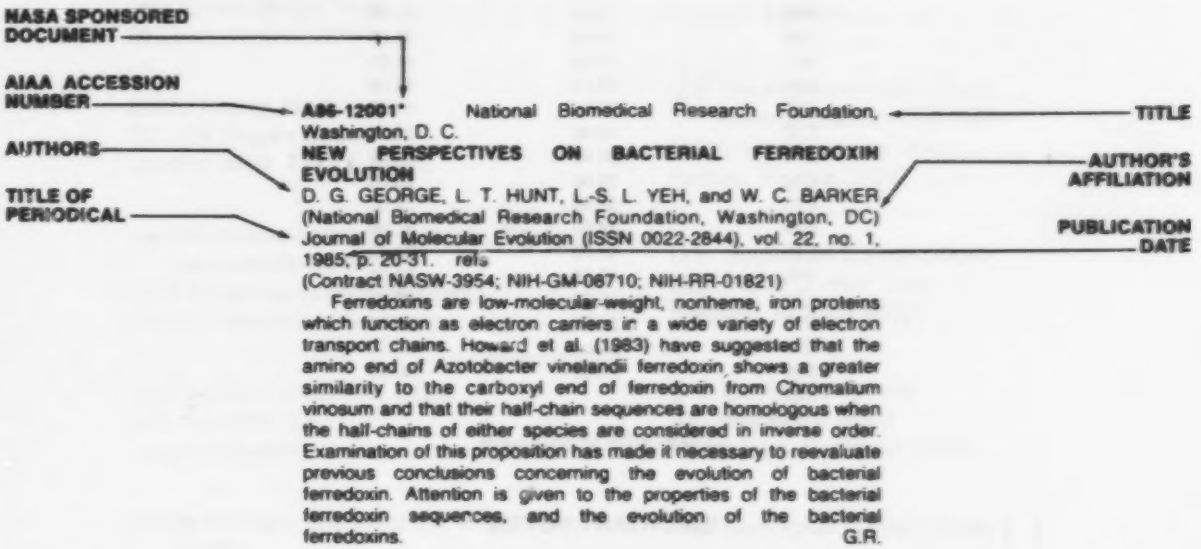
TYPICAL CITATION AND ABSTRACT FROM *IAA*


NASA SPONSORED DOCUMENT
AIAA ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
AUTHORS
NEW PERSPECTIVES ON BACTERIAL FERREDOXIH EVOLUTION
AUTHOR'S AFFILIATION
TITLE OF PERIODICAL
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)
PUBLICATION DATE
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
NASA SP-7011 (283)		

4. Title and Subtitle	5. Report Date
Aerospace Medicine and Biology Continuing Bibliography (Suppiement 283)	April 1986
	6. Performing Organization Code
7. Author(s)	8. Performing Organization Report No.
	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D.C. 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
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15. Supplementary Notes

16. Abstract

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1986.

17. Key Words (Suggested by Author(s))	18. Distribution Statement
Aerospace Medicine Bibliographies Biological Effects	Unclassified - Unlimited

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Aerospace Medicine and Biology
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Accession numbers cited in this Supplement fall within the following ranges.

STAR (N-10000 Series)	N86-18186 – N86-18283
IAA (A-10000 Series)	A86-19291 – A86-22713

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NASA SP-7011(284)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 284)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in April 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1986
National Aeronautics and Space Administration
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This supplement is available from the National Technical Information Service (NTIS), Springfield, Virginia 22161, price code A04.

INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 148 reports, articles and other documents announced during April 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 52 Aerospace Medicine 85
Includes physiological factors; biological effects of radiation; and weightlessness.

Category 53 Behavioral Sciences 94
Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

Category 54 Man/System Technology and Life Support 96
Includes human engineering; biotechnology; and space suits and protective clothing.

Category 55 Planetary Biology 101
Includes exobiology; and extraterrestrial life.

Subject Index A-1
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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 284)

MAY 1986

51

LIFE SCIENCES (GENERAL)

Includes genetics.

A86-19300
THE EFFECT OF A WEAK VARIABLE ULTRALOW-FREQUENCY MAGNETIC FIELD ON THE DEVELOPMENT OF HYPERCOAGULATION SYNDROME IN RATS CAUSED BY RESTRICTED MOBILITY [VLIIANIE SLABOGO PEREMENNOGO MAGNITNOGO POLIA SVERKHNIZKOI CHASTOTY NA RAZVITIE GIPERKOAGULIATSIONNOGO SINDROMA PRI OGRANICHENII PODVIZHNOSTI U KRYS]
N. A. TEMURIANTS and A. V. MIKHAILOV (Simferopol'skii Gosudarstvennyi Universitet, Simferopol, Ukrainian SSR) Biofizika (ISSN 0006-3029), vol. 30, Nov.-Dec. 1985, p. 1046-1049. In Russian. refs

The effect of daily 3-h exposures to a variable magnetic field (VMF) of 8 Hz frequency and 4 A/m field intensity on the hemocoagulation system was studied in rats kept in conditions of either standard, i.e., unrestricted, mobility regime (SMR) or prolonged hypokinesia (HK). Two-week long HK has led to an increase in fibrin content, decreased time of plasma recalcification, decreased fibrinolytic activity, and other shifts indicative of the hypercoagulation syndrome, while prolonged exposures (for 2 to 3 weeks) to VMF of SMR rats caused shifts of these plasma coagulation parameters, relative to control rats (SMR, no VMF), indicative of the hypocoagulation syndrome. Five to nine daily exposures of HK rats to the VMF regime has led to the reversal of all indices of the initial hypercoagulation syndrome to the point of normalization by the 21st day. I.S.

A86-19963*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMES RESEARCH CENTER LIFE SCIENCES PAYLOAD - OVERVIEW OF RESULTS OF A SPACEFLIGHT OF 24 RATS AND 2 MONKEYS
P. X. CALLAHAN, C. SCHATTE, R. E. GRINDELAND (NASA, Ames Research Center, Moffett Field, CA), W. A. LENCKI, G. A. FUNK (NASA, Ames Research Center; GE Management and Technical Services Co., Moffett Field, CA) et al. AIAA, Aerospace Sciences Meeting, 24th, Reno, NV, Jan. 6-9, 1986. 11 p.
(AIAA PAPER 86-0583)

A hardware description and experimental results are reported from the initial STS flight carrying two Research Animal Holding Facility (RAHF) units. The flight was mainly intended for engineering check-out of the RAHF design. The system development and prelaunch preparations are briefly summarized, including the provisions of retrieval teams at alternate landing sites and extensive rehearsals to ensure timely data analysis. The flight revealed a problem with the containment of particulates from the RAHFs and the provision of adequate water for the monkeys. On-board films showed that one of the monkeys experienced motion sickness, from which he recovered after 5 days in space. Necropsy of the subject rats documented suppressed interferon production, loss of muscle mass, an up to 13 percent loss in bone mass (after a one week flight), and a 20 percent decrease in growth-inducing hormone. The volume of data collected is thought to exceed the combined data gathered on all previous U.S. space missions. M.S.K.

A86-20001* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
VOLUME AND DENSITY CHANGES OF BIOLOGICAL FLUIDS WITH TEMPERATURE
H. HINGHOFER-SZALKAY (NASA, Ames Research Center, Moffett Field, CA; Graz, Universitaet, Austria) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Dec. 1985, p. 1686-1689. refs
(Contract FFWF PROJECT 4200)

The thermal expansion of human blood, plasma, ultrafiltrate, and erythrocycte concentration at temperatures in the range of 4-48 C is studied. The mechanical oscillator technique which has an accuracy of 1 x 10 to the -5 th g/ml is utilized to measure fluid density. The relationship between thermal expansion, density, and temperature is analyzed. The study reveals that: (1) thermal expansion increases with increasing temperature; (2) the magnitude of the increase declines with increasing temperature; (3) thermal expansion increases with density at temperatures below 40 C; and (4) the thermal expansion of intracellular fluid is greater than that of extracellular fluid in the temperature range of 4-10 C, but it is equal at temperatures greater than or equal to 40 C. I.F.

A86-20005
VENTILATORY RESPONSES OF HAMSTERS AND RATS TO HYPOXIA AND HYPERCAPNIA
B. R. WALKER, E. M. ADAMS, and N. F. VOELKEL (Tulane University, New Orleans, LA; Colorado, University, Denver) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Dec. 1985, p. 1955-1960. refs

The experimental conditions and measurement techniques are described. The results of the experiment for the normoxic group (30 percent O2) reveal that the tidal volume (VT)/100 g is greater, and the respiratory frequency (f) is lower in hamsters than rats, and the minute ventilation (VE)/100 g in the hamsters is less than the rats. For the hamsters in the hypercapnia environment (5 percent CO2) an increase in VE/100 g through VT, which is less significant than the VE/100 g increase in rats, is observed. The VE/100 g increase for the hamsters and rats in the hypoxic environment (10 percent O2) are the same; however, the hamsters increase is through f and the rats through both VT/100 g and f. The relation between f and metabolic rate is analyzed and the hamsters response to the hypercapnic environment is examined. It is concluded that the response of the hamsters to hypercapnic and hypoxic conditions is significantly different from the rats, which may reflect a genetic adaptation to the fossorial habitat. I.F.

A86-20404* Northrop Services, Inc., Houston, Tex.
REGULATION OF HEMATOPOIESIS IN RATS EXPOSED TO ANTIORTHOSTATIC HYPOKINETIC/HYPODYNAMIA. II - MECHANISMS OF THE 'ANEMIA'
C. D. R. DUNN, P. C. JOHNSON, and R. D. LANGE (NASA, Johnson Space Center; Northrop Services, Inc., Life Sciences Laboratory; Baylor University, Houston, TX; Tennessee, University, Knoxville) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 36-44. refs
(Contract NAGW-308; NAS9-15425; NAS2-10801; NAS2-11586; NAS9-14662)

The cause of the red cell mass (RCM) deficit, which occurs in rats during suspenion, is investigated. The experimental conditions and procedures, in which male Sprague-Dawley rats are subjected to antiorthostatic hyypokinetic/hypodynamia and changes in RCM are monitored, are described. The influences of stress, reduced food and water consumption, and antiorhostatic posture on RCM are analyzed. Changes in body weight, RCM, radioiron incorporation, red blood cells (RBC), and reticulocytes, for the rats after head-down suspension are graphically presented; only the changes in RBC are related to the antiorthostatic posture. The data reveal that anemia is primarily caused by reduced food and water consumption and secondly by restricted movements. I.F.

A86-21451
CHANGES IN IMMUNOREACTIVITY DURING ADAPTATION TO INTERVALS OF HYPOXIC HYPOXIA [NEKOTORYE IZMENENIIA IMMUNOREAKTIVNOSTI ORGANIZMA PRI ADAPTATSKII K PRERYVISTOI GIPOKSICHESKOI GIPOKSII]
B. A. FROLOV, V. A. VORONTSOV, S. N. AFONINA, and N. R. RUSANOVA (Orenburgskii Gosudarstvennyi Meditsinskii Institut, Orenburg, USSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, Nov.-Dec. 1985, p. 646-650. In Russian. refs

Mechanisms influencing the immunoreactivity of rats during adaptation to an hypoxic breathing mixture have been investigated experimentally. It is found that the humoral immune response of rats adapted to hypoxic conditions was intensified in comparison with non adapted animals. Changes in the ability of spleen and thymus tissue to perfuse oxygen were also observed. It is suggested that the above morphofunctional changes in the immunoreactivity of the adapted rats may be related to functional shifts in the mechanisms of neurohumoral regulation. I.H.

A86-21454
CHANGES IN THE HEMOSTATIS SYSTEM OF THE ANIMAL ORGANISM DUE TO GRANULOCYTOPOIESIS INHIBITION UNDER REDUCED BAROMETRIC PRESSURE [IZMENENIIA V SISTEME GEMOSTAZA V USLOVIIAKH UGNETENIIA GRANULOTSITOPOEZA PRI DEISTVII NA ORGANIZM ZHIVOTNYKH PONIZHENNOGO BAROMETRICHESKOGO DAVLENIIA]
N. V. LUNINA and A. F. POLTAVSKII (Voroshilovgradskii Gosudarstvennyi Pedagogicheskii Institut, Voroshilovogad, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, Nov.-Dec. 1985, p. 712-716. In Russian. refs

A86-21455
THE DISTINCTIVE FEATURES OF THE ENERGETIC METABOLISM, GLYCOLYSIS, AND TISSUE RESPIRATION OF THE MYOCARDIUM IN RATS HAVING HIGH AND LOW RESISTANCE TO HYPOXIA [OSOBENNOSTI ENERGETICHESKOGO METABOLIZMA, GLIKOLIZA I TKANEVOGO DYKHANIIA MIOKARDA U VYSOKO- I NIZKOUSTOICHIVYKH K GIPOKSII KRYS]
E. A. MARKOVA and I. R. MISULA (Ternopol'skii Gosudarstvennyi Meditsinskii Institut, Ternopol, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, Nov.-Dec. 1985, p. 737-739. In Russian. refs

It is shown that the content of macroergs and creatinphosphate in rat myocardial tissue is higher in animals showing a high degree of resistance to hypoxia than it is in animals having low hypoxic tolerance. Some possible genetic factors determining the efficiency of oxygen use in the myocardium in the presence of hypoxia, are discussed. I.H.

A86-21587
ARCHAEBACTERIAL LIPIDS IN HOT-SPRING MICROBIAL MATS
D. M. WARD (Montana State University, Bozeman), S. C. BRASSELL, and G. EGLINTON (Bristol, University, England) Nature (ISSN 0028-0836), vol. 318, Dec. 26, 1985, p. 656-659. Research supported by the Royal Society. refs
(Contract NERC-GR3/2951; NERC-GR3/3758; NSF BSR-83-15289)

The first direct comparison between isopranyl ether-linked lipids in hot-spring microbial mats and the observed populations of archaebacteria is reported. The mats are from Yellowstone National Park and may represent modern analogs of Precambrian communities preserved as stromatolites. As relatively simple microbial systems, they are suitable for validating specific molecular markers as indicators of microbial populations within a natural community. It is found that the phytanyl and biphytanyl ethers reflect the measured distribution of methanogenic archaebacteria. C.D.

A86-21588
AN INTRON IN THE 23S RIBOSOMAL RNA GENE OF THE ARCHAEBACTERIUM DESULFUROCOCCUS MOBILIS
J. KJEMS and R. A. GARRETT (Aarhus Universitet, Denmark) Nature (ISSN 0028-0836), vol. 318, Dec. 26, 1985, p. 675-677. Research supported by the Statens Naturvidenskabelige Forskningsrad. refs

The first evidence for the occurrence of an intron within any prokaryotic ribosomal RNA is presented. The intron was found within the 23S rRNA gene of the sulfur-dependent and anaerobic Thermoproteale Desulfurococcus mobilis, which was isolated from hot acidic springs in Iceland at temperatures up to 97 C. The intron contains 622 base pairs, is very A + T-rich (65 percent) compared with the 23S rRNA gene (34 percent), and exhibits a large open reading frame. The splicing site occurs in domain IV of the 23S RNA at a position close to that of an intron of the lower eukaryote Physarum polycephalum. The intron does not readily fall into one of the three classes of eukaryotic nuclear introns because it has features in common with those of classes I (rRNA) and III (transfer RNA). C.D.

A86-22023#
USAF TOXICOLOGY RESEARCH ON PETROLEUM AND SHALE-DERIVED AVIATION GAS TURBINE FUELS
J. A. MARTONE (USAF, Aerospace Medical Research Laboratory, Wright-Pattern AFB, OH) ASME, International Gas Turbine Conference and Exhibit, 30th, Houston, TX, Mar. 18-21, 1985. 4 p. refs
(Contract F33615-80-C-0512)
(ASME PAPER 85-GT-34)

The effect of exposure to the hydrocarbons of aircraft turbine fuels on man is examined. Methods used to establish chemical exposure limits, which include the Threshold Limit Value-Time-Weighted Average (TVL-TWA), TVL-Short-term Exposure Limit (TVL-STEL), and skin notation, are described. The proposed limits for JP-4 are a TLV of 700 mg/cu m, a STEL of 1050 mg/cu m, and n-hexane as a skin notation. Experiments are conducted in which rats are exposed to 2500 and 5000 mg/cu m of JP-4 for 8 months, and 500 and 100 mg/cu m for 90 days. The 8-month data reveal no effect on the rats by the fuel is detected; however, in the 90-day test group reduced weight gain, the formation of hyaline droplets in the proximal tubular epithelium, increased kidney/body weight ratios, and renal carcenoma are observed. The mechanism which causes this hydrocarbon-induced renal effect and its possible influence on man are being investigated. I.F.

A86-22258
DEFENSE STRATEGIES AGAINST HYPOXIA AND HYPOTHERMIA
P. W. HOCHACHKA (British Columbia, University, Vancouver, Canada) Science (ISSN 0036-8075), vol. 231, Jan. 17, 1986, p. 234-241. NSERC-supported research. refs

The mechanisms underlying the tolerance to hypoxia and hypothermia are investigated at the cellular level. It is found that the most serious perturbations of hypoxia and hypothermia arise from an imbalance between (1) the extent of depression of adenosine triphosphate (ATP) synthesis rates and (2) the depression of processes requiring membrane-based ATP. When metabolic and membrane functions are decoupled, the cells (tissues or organisms) necessarily become sensitive to hypoxia, to hypothermia, or to both conditions. The similarities and differences in mechanisms of adaptation to hypoxia and hypothermia are analyzed with emphasis on opportunities for novel intervention strategies. V.L.

A86-22324
EFFECT OF IMMOBILIZATION STRESS ON BODY WEIGHT IN RATS
R. INABA, T. FURUNO, and A. OKADA (Kanazawa University, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 21, Dec. 1984, p. 51-55. refs

The present study was aimed at studying the effects of emotional stress on the balance between energy intake and loss in rats. Rats were immobilized for one hour (0900-1000 hr) daily in a cylinder type mesh wire cage for one week. Food and water were not provided during this one hour period in both immobilized and control rats. During immobilization, body weight decreased three times as much in the control, but urine and feces volume did not change. In the immobilized rats, water intake significantly increased at night but food intake did not change. Thus, the mechanism other than reduced energy intake or increased excreta, such as increased energy consumption, may be contributing to the reduced body weight in the rat subjected to immobilization stress. However, the reduction of body weight during immobilization stress was not recovered at night with a significant increase in water intake. After repeated exposures to immobilization stress, the reduction of body weight began to be recovered at night. However, only a day pause in the immobilization stress abolished this phenomenon. Author

A86-22546
THE EFFECT OF ENKEPHALINS ON METABOLIC PARAMETERS OF RATS IN THE PRESENCE OF ACUTE EXPERIMENTAL BLOOD LOSS [VLIIANIE ENKEFALINOV NA METABOLICHESKIE POKAZATELI PRI EKSPERIMENTAL'NOI OSTROI KROVOPOTERE U KRYS]
G. K. ZOLOEV (Vsesoiuznyi Kardiologicheskii Nauchnyi Tsentr, Tomsk, USSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Nov.-Dec. 1985, p. 25-28. In Russian. refs

A86-22547
MICROCIRCULATORY CHANGES IN RATS WITH BURN SHOCK FOLLOWING ADAPTATION TO HIGH-ALTITUDE HYPOXIA [IZMENENIE MIKROTSIRKULIATSII PRI OZHOGOVOM SHOKE U KRYS, ADAPTIROVANNYKH K VYSOTNOI GIPOKSII]
Z. R. ATADZHANOVA (Institut Obshchei Patologii i Patologicheskoi Fiziologii, Moscow, USSR) and IU. M. SHTYKHNO Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Nov.-Dec. 1985, p. 28-31. In Russian. refs

A86-22548
INCREASED RESISTANCE OF THE BRAIN TO HYPOXIA DUE TO A COMBINATION OF LITHIUM HYDROXYBUTYRATE AND INDOMETHACINE [POVYSHENIE REZISTENTNOSTI MOZGA K GIPOKSII S POMOSHCH'IU SOCHETANNOGO PRIMENENIIA OKSIBUTIRATA LITIIA I INDOMETATSINA]
IU. G. BOBKOV and I. A. IVANOVA (Nauchno-Issledovatel'skii Institut Farmakologii, Moscow, USSR) Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Nov.-Dec. 1985, p. 31-34. In Russian. refs

An investigation of the antihypoxic effect of lithium hydroxybutyrate and indomethacin have been investigated experimentally in dogs having acute recurrent asphyxial hypoxia. Brain function was monitored following injection of separate and combined dosages of lithium hydrobutyrate and indomethacin. It is shown that both drugs possess a marked antihypoxic effect on the links in the hypoxia pathogenesis. A combined dose led to an increase in the number of animals remaining unimpaired following four successive periods of anhypoxia. I.H.

A86-22593
RESISTANE, EXCHANGE AND CAPACITANCE FUNCTIONS OF SKELETAL MUSCLE VESSELS IN THE PRESENCE OF ACUTE HYPOXIC HYPOXIA [REZISTIVNAIA, OBMENNAIA I EMKOSTNAIA FUNKTSII SOSUDOV SKELETNOI MUSKULATURY PRI OSTROI GIPOKSICHESKOI GIPOKSII]
B. I. TKACHENKO and IU. I. IBRAGIMOV (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Oct. 1985, p. 1229-1237. In Russian. refs

It is shown that acute hypoxia (10 percent O2 in nitrogen) increases precapillary resistance of skeletal muscle vessels in hemodynamically isolated cats. Postcapillary resistance was reduced, by about 30 percent together with capillary hydrostatic pressure and the capillary filtration coefficient (CFC). Similar changes were observed in the denervated vascular bed under cross circulation. I.H.

A86-22594
CHANGES IN THE FUNCTION OF SKELETAL MUSCLE VESSELS DUE TO THE CARDIOGENIC DEPRESSOR REFLEX [IZMENENIIA FUNKTSII SOSUDOV SKELETNOI MUSKULATURY PRI KARDIOGENNOM DEPRESSORNOM REFLEKSE]
M. V. ENIKEEV (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Oct. 1985, p. 1252-1257. In Russian. refs

Variations in the vascular resistance and capillary filtration coefficient of cat hindlimb blood vessels were studied during the cardiogenic depressor reflex. Measurements of integral stretching ability and vessel capacitance were also obtained. It is found that short term compression of the left coronary artery induced a decrease in the perfusion pressure and capillary filtration coefficient. The integral stretching ability of the venous bed and venous capacitance were also increased in response to compression of the left coronary artery. The morphofunctional mechanism underlying the variations in vascular response are discussed. I.H.

A86-22595
THE EFFECT OF SHORT TERM HYPOXIA ON BODY TEMPERATURE AND LACTIC ACID IN BLOOD [VLIIANIE KRATKOVREMENNOI GIPOKSII NA TEMPERATURU TELA I MOLOCHNUIU KISLOTU V KROVI U MYSHEI]
S. N. PISARENKO, A. S. SEPISHEVA, and A. D. SLONIM (AN KSSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogor'ia, Frunze, Kirgiz SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Oct. 1985, p. 1282-1286. In Russian. refs

Changes in body temperature and lactic acid content were studied in mouse blood following a three-step exposure to barochamber hypoxia at an altitude of 8000 meters. Air temperatures in the chamber were 10, 20, and 36 C, respectively. The greatest drop in body temperature was observed at a temperature of 10 C, and the smallest drop occurred at 36 C.

The highest level of lactic acid content was (up to 3.6 mM/1) was recorded two minutes after exposure to the hypoxia, and the lowest level was recorded two minutes following readaptation. Some possible mechanisms for the observed variations are discussed. Emphasis is given to the occurrence of repeated hyperventilation due to conditioning. I.H.

A86-22650
THE ELUSIVE MECHANISM OF THE CIRCADIAN CLOCK
C. H. JOHNSON and J. W. HASTINGS (Harvard University, Cambridge, MA) American Scientist (ISSN 0003-0996), vol. 74, Jan.-Feb. 1986, p. 29-36. Research supported by the National Institute of Health. refs

Experimental strategies which are applied to elucidate the biochemical mechanism of the circadian system are described. A review of the basic properties of the circadian cycle and examples of organisms which possess these properties are presented. Clinical studies conducted to analyze the effect of cyclic changes, induced by jet lag or drugs, on mental and physical health are discussed. The development of models in order to understand the biochemical mechanism which controls the cycle is examined. Eskin's (1979) three approaches to identifying the mechanism are analyzed. Perturbations in the clock, either drug-induced or mutations, are investigated to provide data on the mechanism. Characterization of the entrainment pathway by following the photon to the pacemaker and characterization of the coupling pathway by tracing an overt rhythm to the pacemaker are proposed as means of identifying the mechanism. The analysis of enzymes is an additional approach toward determining the nature of the biochemical mechanism. Examples revealing the applicability of these research strategies are provided. I.F.

A86-22663
HEAT ACCLIMATION - CARDIAC PERFORMANCE OF ISOLATED RAT HEART
M. HOROWITZ, Y. SHIMONI, S. PARNES, M. S. GOTSMAN, and Y. HASIN (Jerusalem, Hebrew University; Haddassah University Hospital, Israel) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Jan. 1986, p. 9-13. refs

The cardiovascular system is a powerful effector of the thermoregulatory system. Following acclimation to heat, cardiac output and stroke volume are elevated. In addition, it has been found that in cardiac ventricles of 1- and 2-mo-acclimated rats there is a transition from fast myosin (V1) to slow myosin (V3) isozyme. The prolonged state of increased cardiac output maintained by increased stroke volume and the increased share of V3 myosin isozyme may result in alterations in the function of the acclimated heart as a pump. The present investigation has the objective to examine this hypothesis by establishing pressure-volume relations during isovolumic contraction and by studying the effects of changes in beating rate on the contractile response of the isolated hearts obtained from rats after 2 mo of acclimation to heat. The results of the investigation show that adaptation of cardiac muscle of sedentary rats to heat is associated with increased efficiency due to increased elasticity. G.R.

A86-22709* Florida State Univ., Tallahassee.
INTRACELLULAR PH SHIFT LEADS TO MICROTUBULE ASSEMBLY AND MICROTUBULE-MEDIATED MOTILITY DURING SEA URCHIN FERTILIZATION - CORRELATIONS BETWEEN ELEVATED INTRACELLULAR PH AND MICROTUBULE ACTIVITY AND DEPRESSED INTRACELLULAR PH AND MICROTUBULE DISASSEMBLY
G. SCHATTEN, T. BESTOR, R. BALCZON, J. HENSON, and H. SCHATTEN (Florida State University, Tallahassee) European Journal of Cell Biology (ISSN 0171-9335), vol. 36, 1985, p. 116-127. refs
(Contract NAG2-340; NIH-HD-12913)

A86-22710* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DETERMINING A CARBOHYDRATE PROFILE FOR HANSENULA POLYMORPHA
G. R. PETERSEN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) Enzyme and Microbial Technology (ISSN 0141-0229), vol. 7, July 1985, p. 339-345. NASA-supported research. refs

The determination of the levels of carbohydrates in the yeast Hansenula poiymorpha required the development of new analytical procedures. Existing fractionation and analytical methods were adapted to deal with the problems involved with the lysis of whole cells. Using these new procedures, the complete carbohydrate profiles of H. polymorpha and selected mutant strains were determined and shown to correlate favourably with previously published results. Author

A86-22713* Wisconsin Univ., Madison.
REGULATION OF BONE MINERAL LOSS DURING LACTATION
R. BROMMAGE and H. F. DELUCA (Wisconsin, University, Madison) American Journal of Physiology: Endocrinology and Metabolism (ISSN 0193-1849), vol. 248, 1985, p. E182-E187. Research supported by the Wisconsin Alumni Research Foundation. refs
(Contract NIH-AM-14881; NAG2-167)

The effects of varyng dietary calcium and phosphorous levels, vitamin D deficiency, oophorectomy, adrenalectomy, and simultaneous pregnancy on bone mineral loss during lactation in rats are studied. The experimental procedures and evaluations are described. The femur ash weight of lactating and nonlactating rats are calculated. The data reveals that a decrease in dietary calcium of 0.02 percent results in an increased loss of bone mineral, an increase in calcium to 1.4 percent does not lessen bone mineral loss, and bone mineral loss in vitamin D deficient rats is independent of calcium levels. It is observed that changes in dietary phosphorous level, oophorectomy, adrenalectomy, and simultaneous pragnancy do not reduce bone mineral loss during lactation. The analysis of various hormones to determine the mechanism that triggers bone mineral loss during lactation is presented. I.F.

N86-16875*# Alabama Univ., Birmingham. Comprehensive Cancer Center.
PROTEIN CRYSTAL GROWTH RESULTS FROM SHUTTLE FLIGHT 51-F Final Report
C. E. BUGG 17 Oct. 1985 7 p
(Contract NAS8-36611)
(NASA-CR-178540; NAS 1.26:178540) Avail: NTIS HC A02/MF A01 CSCL 06C

The protein crystal growth (PCG) experiments run on 51-F were analyzed. It was found that: (1) sample stability is increased over that observed during the experiments on flight 51-D; (2) the dialysis experiments produced lysozyme crystals that were significantly larger than those obtained in our identical ground-based studies; (3) temperature fluctuations apparently caused problems during the crystallization experiments on 51-F; (4) it is indicated that teflon tape stabilizes droplets on the syringe tips; (5) samples survived during the reentry and landing in glass tips that were not stoppered with plungers; (6) from the ground-based studies, it was expected that equilibration should be complete within 2 to 4 days for all of these vapor-diffusion experiments, thus it appears that the vapor diffusion rates are somewhat slower under microgravity conditions; (7) drop tethering was highly successful, all four of the tethered drops were stable, even though they contained MPD solutions; (8) the PCG experiments on 51-F were done to assess the hardware and experimental procedures that are developed for future flights, when temperature control will be available. Lysozyme crystals obtained by microdialysis are considerably larger than those obtained on the ground, using the identical apparatus and procedures. E.A.K.

N86-16876# Army Research Inst. of Environmental Medicine, Natick, Mass.
A SYSTEM OF RAT RESTRAINT USING A CONE-SHAPED, PLEXIGLASS AND STAINLESS STEEL ROD CAGE
G. J. THOMAS, C. B. MATTHEW, W. T. MATTHEW, and R. HUBBARD 1 Feb. 1985 19 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A158428; USARIEM-T6/85) Avail: NTIS HC A02/MF A01 CSCL 14B

A system of rat restraint was needed to allow maximum accessibility to the animal. This system, designed inhouse, is constructed of 3/8-in plexiglass and stainless steel rods. Several special design features, including the adjustment of size to accomodate a wide weight range of animals, are superior to commerical varieties. This system has been used extensively in two published studies and other uncompleted studies and has adapted well to many applications. GRA

N86-16877# Army Research Inst. of Environmental Medicine, Natick, Mass.
SIMULTANEOUS DETERMINATION OF FLUID SHIFTS DURING THERMAL STRESS IN A SMALL ANIMAL MODEL
M. J. DURKOT, O. MARTINEZ, D. BROOKS-MCQUADE, and R. P. FRANCESCONI Sep. 1985 21 p
(Contract DA PROJ. 3M1-61102-BS-10)
(AD-A159363; USARIEM-M-39/85) Avail: NTIS HC A02/MF A01 CSCL 06S

We have developed methodology to measure simultaneously fluid redistribution among the major compartments during moderate and severe hypohydration. Total body water (TBW) was determined using tritiated water, extracellular fluid volume, (ECF) was measured using a single injection C-14 insulin technique, and plasma volume (PV) was determined by cardio-green dye dilution. Moderate (10% decrease in body weight) and severe (15%) hypohydration resulted in significant losses in TBW, ECF and PV. Plasma volume was decreased by approximately 25% in both groups, and other fluid compartments were differentially affected. For example, the moderately dehydrated group maintained PV by shifting fluid from the ECF and ISF (interstitial fluid) compartment while preserving the ICF (intracellular fluid) conversely, the severely dehydrated group maintained PV by redistributing fluid from both the ECF and ICF compartments. The data indicated that the initial response to fluid loss was the movement of fluid from the ECF pool to sustain both PV and ICF. In severely hypohydrated rats, PV was maintained at the expense of ICF. These experiments indicate that PV and ICF are maximally protected, probably to preserve the integrity of the cardiovascular system and to minimize organ injury. GRA

N86-16878# Texas Univ., Austin. Lab. of Radiation Biology.
PHYSICO-CHEMICAL STUDIES OF RADIATION EFFECTS IN CELLS Progress Report, 15 Feb. 1984 - 14 Feb. 1985
E. L. POWERS 1985 13 p refs
(Contract DE-AS05-76EV-03408)
(DE85-014681; DOE/EV-03408/T1) Avail: NTIS HC A02/MF A01

The radioprotective effects of Hg(++) were investigated in Staphylococcus aureus and Pseudomonas aeruginosa bacteria having very different gc ratios in their DNA. A protective effect is seen in both with first order curves or at least in the k/sub L/ region of the breakpoints. However, it is curious that there is a distinct difference in the metal-free N2 baseline of Staphylococcus aureus compared to its EtOH metal-free N2 response while with Pseudomonas aeruginosa both the metal-free N2 baseline and its EtOH metal-free results are similar. In related studies a new radioprotective substance was evaluated in bacterial systems. Results showed that, in the presence of Rh(NH3)3C/3, the anoxic cell shows greater sensitivity than the oxygenated cell. This compound has considerable therapeutic promise providing it acts the same on mammalian cells. DOE

N86-16879# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
BIOLOGICAL EFFECTS OF MILLIMETER WAVES ON THE MOUSE
C. O. CRIBORN, C. HENRIKSSON, and L. D. WERNLUND Aug. 1985 17 p refs In SWEDISH; ENGLISH summary
(FOA-C-50023-H1; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

To study the effects of millimeter waves on respiration, rectal temperature, and of an acoustic reaction on mice, animals aged 60 to 70 days, weighing 25 to 30 g, were irradiated by 2 different oscillators with a power intensity of 10 mW/sqcm at frequencies of 35 and 94,3 GHz. The absorbed irradiation was converted into heat which the mouse compensated for by decreased respiratory minute volume. The acoustic reaction was acutely affected in positive or negative direction depending on the frequency. The effects return to normal values 5 to 20 min after irradiation. No significant variation of the body temperature is noted.
Author (ESA)

N86-16880# National Academy of Sciences - National Research Council, Washington, D. C.
MODELS FOR BIOMEDICAL RESEARCH: A NEW PERSPECTIVE
1985 190 p
(Contract NO1-RR-3-2112)
(PB85-240067; ISBN-0-309-03538-4; LC-85-60945) Avail: NTIS HC A09/MF A01 CSCL 06E

Models for Biomedical Research provides a historical summary of the concept and use of models and their contributions to biomedical knowledge, evaluations of the utility of nonmammalian models, with particular attention to nonmammalian vertebrates, invertebrates, microorganisms, cell and tissue culture systems, and mathematical models. The report proposes a new perspective on the role of models, whereby they serve as sources of information that can be generalized to the total body of biological knowledge rather than directly, or only, to humans. In the course of the study six workshops were held to explore the use of models in various aspects of biomedical research. Summaries of the workshops are included as appendices to the report.
Author (GRA)

N86-16881# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
10 Dec. 1985 78 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-85-025) Avail: NTIS HC A05/MF A01

Progress on research and developments in the Soviet life, biomedical, and behavioral sciences, is reported. Topics discussed include: aerotechnology, biochemistry, bionics, biotechnology, epidemiology, genetics, human factors engineering, immunology, medicine, laser effects, molecular biology, pharmacology, and toxicology, physiology, and public health.

N86-16883# Joint Publications Research Service, Arlington, Va.
DYNAMICS OF PEROXIDE OXIDATION OF LIPIDS DURING STRESS Abstract Only
E. M. MIKAYELAN and V. G. MKHITARYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-025) p 11 10 Dec. 1985 Transl. into ENGLISH from Biologicheskiy Zhurnal Armenii (Yerevan, USSR), v. 38, no. 5, May 1985 p 393-398
Avail: NTIS HC A05/MF A01

The dynamics of peroxide oxidation of lipids (POL) was studied on white rats during acute stress of varying duration and during chronic stress. Alterations in formation and removal of lipo-peroxides, the direction and intensity depending on the stage of stress and on tissue specificity are shown. During acute stress, POL intensified, especially in the heart. It is shown that alpha-tocopherol levels in blood and in erythocyte membranes dropped during acute stress, while they remained stable in the heart, liver and brain. Repeated stress intensified the POL and

activated the glutathioneperoxidase-glutathionereductase system. Under chronic stress, the POL dimished, alpha tocopherol levels in tissues became lower in all phases of the stress, altering the structure and function of biomembranes and necessitating antioxidative prophylactic measures and therapeutic interventions because the cell metabolism was comprised. E.A.K.

N86-16885# Joint Publications Research Service, Arlington, Va.
MITOCHONDRIAL MANIFESTATIONS OF STRESS AND RESPONSE TO HORMONAL STIMULATION AND HYDROAEROIONS Abstract Only
M. N. KONDRASHOVA and Y. V. GRIGORENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-025) p 35 10 Dec. 1985 Transl. into ENGLISH from Zhurnal Obshchey Biologii (Moscow, USSR), v. 46, no. 4, Jul. - Aug. 1985 p 516-526
Avail: NTIS HC A05/MF A01

Hepatic and cerebral mitochondrical suspensions obtained from Wistar and August rats were studied to assess the effects of immobilization stress. The mitochondrial preparations exhibited manifestations of stardard biphasic response of physiological stress, which consisted of an initial enhancement of energy metabolism which was reflected in increased succinate oxidation and elevated respiratory rate. These changes were consonant with an initial upsurge in epinephrine release into the blood stream. With ongoing stress, succinate oxidation shows a corresponding increase accompanied, however, by greater increase in an antithetical process-inhibition of succinate dehydrogenase by oxalacetate and the products of serotonin oxidation. Treatment of the stressed animals with sightly charged negative hydroaeroions abrogated the latter effects, and resulted in an increase in mitochondrial respiration to above-background levels. The rapid change seen with the hydroaerions is ascribed to electrobiochemical mechanisms which is responsible for enzyme activation. E.A.K.

N86-16886# Joint Publications Research Service, Arlington, Va.
CYTOGENETIC CHANGES IN CELLS OF LETTUCE SEEDLINGS WITH EXPOSURE TO ACCELERATED CARBON ION BEAM
A. I. VIKHROV, Y. Y. KOVALEV, Y. N. MAKSIMOVA, L. V. MEVZGODINA, and Y. V. POTAPOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-025) p 62-68 10 Dec. 1985 refs Transl. into ENGLISH from Radiobiologiya (Moscow,
Avail: NTIS HC A05/MF A01

The effects of single hits on accelerated carbon ions in the lettuce seeds were studied. Data on the frequency of aberrant cells in lettuce seedlings as a function of the number of hits after exposure to C carbon ions are presented. The number of particles, which passed through the biological objects, and the dose values, received by each seed considering the contribution of secondary radiation in these doses, are presented. E.A.K.

N86-17974 Admiralty Marine Technology Establishment, Portsmouth (England). Dockyard Lab.
THE EVALUATION OF COPPER COMPOUNDS AS POTENTIAL FUEL BIOCIDES
J. T. GISBORNE, P. ROBINSON, and M. SHEARMAN May 1984 8 p refs
(AMTE(M)-84520; BR94710) Avail: NTIS HC A02/MF A01

Copper oxide, acetate, nitrate, and sulfate compounds, envisaged as antifungal agents for fuel tank coatings, were tested for biocidal activity using bridged slide and test tube methods. High dose levels are required of each compound before the germination of the fungus Cladosporium resinae is inhibited.
Author (ESA)

N86-17975# Naval Air Systems Command, Washington, D. C.
INVERSE FARADAY EFFECT IN HEMOGLOBIN DETECTED BY RAMAN SPECTROSCOPY: AN EXAMPLE OF MAGNETIC RESONANCE RAMAN ACTIVITY Final Report
T. W. BARRETT 3 Jun. 1985 35 p
(AD-A159806; NADC-85074-60) Avail: NTIS HC A03/MF A01 CSCL 06A

A complete polarization study of human oxy and carbonmonoxyhemoglobin A and S is reported for backscattered light in the resonance Raman light scattering situation with excitations in the long wavelength region, wavelength = 4579 A and 5815 A, and excitation in the short wavelength region, wavelength = 4579 A and 4880 A, as comparison. All four polarization components of the scattered light with respect to the two polarization conditions of linearly and circularly polarization of the incident light were measured. These were: (1) parallel; (2) perpendicular; (3) corotating; and (4) contrarotating. GRA

N86-17976# Minnesota Univ., Minneapolis. Immunobiology Research Center.
HLA-D: THE T CELL PERSPECTIVE
F. H. BACH, N. OHTA, A. ANICHINI, and N. L. REINSMOEN 1985 32 p
(Contract N00014-85-K-0004; PHS-AI-17687)
(AD-A160019) Avail: NTIS HC A03/MF A01 CSCL 06P

The introduction of the mixed leukocyte culture test (MLC) combined with the establishment of a one-way method of stimulation in MLC allowed the correlation of proliferative response in MLC with results of serological studies and the suggestion that reactivity in MLC is controlled by the major histocompatibility complex in man, now known as HLA. That the chromosomal region of HLA which controls the strongest stimulatory determinants for MLC (now known as the HLA-D region) was different from the class I encoding genes was already suggested in two early studies. Definitive evidence in this regard came from the studies of Yunis and Amos (1971). It is our purpose in this paper to discuss our current knowledge of the HLA-D region from the T cell perspective, an area that has been recently reviewed. The use of techniques that allow definition of determinants recognized by T lymphocytes and associated with HLA class II molecules has, thus, allowed definition of further polymorphisms not recognized with currently available/characterized serological reagents. Given the intimate relationship thought to exist between T lymphocyte recognition and major histocompatibility complex encoded molecules, definition of this LD (T lymphocyte defined), polymorphism may be of the greatest import. GRA

N86-17977# Minnesota Univ., Minneapolis.
CLONAL ANALYSIS OF HLA-DR AND -DQ ASSOCIATED DETERMINANTS: THEIR CONTRIBUTION TO DW SPECIFICITIES
N. L. REINSMOEN and F. H. BACH 1985 39 p
(Contract N00014-85-K-0004)
(AD-A160059) Avail: NTIS HC A03/MF A01 CSCL 06P

In order to investigate the distribution of epitopes recognized by T cell clones directed against HLA class II products, bulk primed cell populations were generated using cells matched for class I determinants but disparate for class II determinants. Cells were cloned by single cell deposition (FACS IV) or limiting dilution (1 cell/3 wells), and assayed for proliferative and cytolytic function with panels of well-characterized cells. Our data indicate that determinants detected on both DR and DQ products are associated with the Dw type of the sensitizing cell showing that there is polymorphism recognized by T cells on both DR and DQ that is subtypic to the serologically defined specificities. Thus, it appears that the bulk T cell response is a composite of individual clones recognizing distinct determinants on these class II molecules. The implications of these findings for studies of HLA restricted recognition are discussed. GRA

N86-17978# Department of Energy, Washington, D. C.
METHOD FOR IMPROVING PRODUCT YIELDS IN AN ANIONIC METALLOPORPHYRIN-BASED ARTIFICIAL PHOTOSYNTHESIS SYSTEM Patent Application
J. A. SHELNUTT, inventor (to DOE) 29 Nov. 1984 27 p
(Contract DE-AC04-76DP-00789)
(DE85-017723; US-PATENT-APPL-SN-676046) Avail: NTIS HC A03/MF A01

A method is disclosed improving product yields in an anionic metalloporphyrin-based artificial photosynthesis system for hydrogen generation. The method comprises forming an aqueous solution comprising an electron donor, methylviologen, and certain metalloporphyrins and metallochlorins, and irradiating said aqueous solution with light in the presence of a catalyst. In the photosynthesis process, solar energy is collected and stored in the form of a hydrogen. Ligands attached above and below the metalloporphyrin and metallochlorin plane are capable of sterically blocking photochemically inactive electrostatically bound (PI)-(PI) complexes which can develop. DOE

N86-17979# Argonne National Lab., Ill.
PROTEIN MAPPING AND THE PROBLEM OF COMPLEXITY IN MOLECULAR BIOLOGY
L. ANDERSON and N. ANDERSON 1985 7 p Presented at the Electrophorese Forum, Munich, West Germany, 21 Oct. 1985
(Contract W-31-109-ENG-38)
(DE85-018349; CONF-8510157-1) Avail: NTIS HC A02/MF A01

Two-dimensional electrophoretic protein mapping is now ten years old. Although it was evident to many in 1975 that a system for separating thousands of proteins would have a great effect on biology, the true parameters of this revolution are only now becoming apparent. This paper discusses what has been affected by the development of protein mapping, what the possibilities are now, why it has taken a decade to get this far. DOE

N86-17980# Medical Biological Lab. RVO-TNO, The Hague (Netherlands).
REPORT OF THE SYMPOSIUM ON BIOLOGICAL MONITORING OF EXPOSURE TO METALS AND OTHER INORGANIC COMPOUNDS [VERSLAG VAN HET SYMPOSIUM: BIOLOGICAL MONITORING OF EXPOSURE TO METALS AND OTHER INORGANIC COMPOUNDS]
P. C. BRAGT 1985 12 p In DUTCH Symposium held in Miami, Fla., 30 Apr. - 2 May 1985
(MBL-1985-6; TDCK-93252) Avail: NTIS HC A02/MF A01

Metal concentration measurements in blood and urine, methods used, and social aspects within industrial sanitation, are discussed. Concentration measurements were done on Al, As, Cd, Cr, Hg, Ni, and Pb. Analysis methods such as inductively coupled plasma atomic emission spectrophotometry (ICP-AEA), and ICP electrothermal vaporization combination, ICP with cross flow nebulizer, inductively coupled argon plasma optical emission spectroscopy and Zeeman effect graphite furnace, were considered. Concerning an eventual legal status of biological monitoring, aspects of quality control were emphasized.
Author (ESA)

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-19332
NON-INVASIVE PHYSIOLOGIC BRAIN MONITORING IN USAF OPERATIONAL ENVIRONMENTS
M. S. HASWELL (USAF, School of Aerospace Medicine, Brooks AFB, TX) and F. JOBSIS (Duke University, Medical Center, Durham, NC) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 200-203.

Noninvasive optical monitoring of cerebral energy metabolism represents a decade of development at Duke University and is designed to measure brain hemoglobin oxygen saturation, blood volume, and a key indicator of tissue oxygenation, the cytochrome oxidase oxidation level. This instrumentation has been successfully used to monitor patients during surgery. Consequently, an attempt has been made to ascertain the potential for this capability in monitoring humans exposed to the environments of increased +G(z) and hypoxia. The standard USAF aircrew helmet was modified to accept the fiber-optic monitoring probes. Two subjects, while wearing the modified helmet, were exposed to various conditions known to perturb the measurable brain variables at 1 G: hyperventilation, Valsalva maneuver, or breathing 100 percent O2. The results indicated a reduction in brain blood flow and tissue oxygen availability with hyperventilation, and an increase in blood volume with the Valsalva maneuver. These results, along with potential applications of noninvasive optical brain monitoring in the laboratory as a research tool, and in USAF operations as an indicator of pilot performance capability, will be discussed.
Author

A86-19346
SIMULATOR SICKNESS - INCIDENCE OF SIMULATOR AFTEREFFECTS IN NAVY FLIGHT TRAINERS
R. S. KENNEDY, B. DUTTON (Essex Corp., Orlando, FL), M. G. LILIENTHAL, G. L. RICARD (U.S. Navy, Naval Training Equipment Center, Orlando, FL), and L. H. FRANK (Virginia Polytechnic Institute and State University, Blacksburg) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 299-302. refs

Simulator sickness in flight trainers is studied. Symptoms of simulator sickness include: disorientation, dizziness, nausea, vomiting, drowsiness, and visual problems. The negative implications of simulator sickness, such as learning improper adaptive responses to light situations or injury, are discussed. A program designed to survey the incidence of simulator sickness is implemented. A fine-grained analysis of motion sickness obtained during helicopter simulation, two case histories involving reactions to simulation, and a survey of simulator sickness at ten Navy simulators are described. Means of alleviating simulator symptoms until the problem can be eliminated are examined. I.F.

A86-19347
DECOMPRESSION SICKNESS AND INTRAVENOUS BUBBLE FORMATION USING A 7.8 PSI SIMULATED PRESSURE-SUIT ENVIRONMENT
G. A. DIXON (USAF, School of Aerospace Medicine, Brooks AFB, TX), J. D. ADAMS, and W. T. HARVEY IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 303-307.

An experiment conducted to locate the pressure where decompression sickness (DCS) will not occur is described. Thirty males ranging in age from 20-41 are subjected to a 7.8 psi environment for a 6-hour period for three days and participate in

exercise workloads. The monitoring of the subjects for intravenous gas bubbles using ultrasonic Doppler bubble detection techniques is examined. Bubble pattern data for the 30 subjects are tabularly presented. The data reveal only 26.7 percent of the subjects are bubble free for all three days and 73.7 percent experience bubble formation at least one day. The experimental conditions result in a 3.3 percent incidence of DCS; therefore, a minimum suit pressure of greater than 7.8 psi is necessary to eliminate DCS. I.F.

A86-19348
HAND GRIP STRENGTH DECREASE RELATED TO HAND SKIN TEMPERATURE DROP DURING SIX-HOUR ICE COLD WATER IMMERSION
R. ILMARINEN (Institute of Occupational Health, Helsinki, Finland) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 330-333. refs

The relation between hand skin temperature and hand grip strength, and the thermal protective qualities of survival suits during exposure to ice cold water immersion are studied. Five female and five male subjects are exposed to six hours of ice cold water in this experiment. The calculation of hand skin temperature with a thermistor, and hand grip strength with a dynamometer are described. A 12 C decrease in hand skin temperature and a 30 percent decrease in hand grip strength in the first two hours of exposure, and a linear relation between hand grip strength and hand skin temperature are observed. The observations reveal that physical cooling and cold-induced vasoconstriction cause a drop in hand skin temperature and hand grip strength. The gloves and sleeves of the survival suits did not provide the adequate thermal insulation required to maintain hand skin temperature and hand grip strength. I.F.

A86-19351
EVALUATION OF PILOT PERFORMANCE AND AIRCREW PROTECTIVE DEVICES IN A SIMULATED F-14 FLAT SPIN ENVIRONMENT
J. EYTH, JR. and D. P. GLEISNER (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 350-355. refs

A pilot's response to a simulated F-14 flat spin is studied. The F-14 aerodynamic model and the human centrifuge motion platform of the Dynamic Flight Simulator are examined. A spin recovery test is performed to evaluate a pilot's ability to recover the aircraft from the spin and determine what factors influence an unsuccessful recovery. The spin warning display system and restraint system evaluated in the spin test are described. Graphs are provided on the number of revolutions, altitude loss, and recovery time as a function of spin entry condition. The results reveal that higher yaw rates cause an increase in the number of revolution, greater altitude loss prior to recovery of the aircraft, and the pilots are not incapacitated by the high -Gx forces. The spin warning display and restraint systems are highly rated by the pilots. I.F.

A86-20002
EFFECTS OF RAISED BODY TEMPERATURE ON REASONING, MEMORY, AND MOOD
R. L. HOLLAND, J. A. SAYERS, W. R. KEATINGE, H. M. DAVIS, and R. PESWANI (London Hospital, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Dec. 1985, p. 1823-1827. SERC-supported research. refs

Ten males and ten females are immersed in water of 37 and 41 C for approximately 15 minutes until core temperature rises to 39 + or - 0.2 C and then they are tested. The methods used to measure core and skin temperature, and access long and short term memory, reasoning, and mood are described. The relations between raised core temperature, and memory registration or recall, the speed of performing reasoning problems, and mood are analyzed. The data reveal that long and short term memory, and the accuracy of performing verbal logic problems or two-digit subtractions are not affected by increased core temperature; however, a significant increase in the speed of performing the tests is observed. An increase in irritability and a decrease in alertness are detected in the subjects. Reasons for improved speed of performance at higher core temperatures are discussed. I.F.

A86-20003
EFFECTS OF BREATHING PATTERN ON INSPIRATORY MUSCLE ENDURANCE IN HUMANS
T. L. CLANTON, G. F. DIXON, J. DRAKE, and J. E. GADEK (Ohio State University, Columbus) Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Dec. 1985, p. 1834-1841. Research supported by the Bremer Foundation and Ohio State University. refs

Changes in duration of inspiration and inspiratory flow rate (VTI), and their effects on endurance are studied. The procedures for testing inspiratory muscle endurance of three males and three females using a threshold resistance which produces a constant mouth-pressure load are described. Endurance is measured as length of time a target VTI could be a maintained with maximum effort. The influence of changes in breathing frequency on endurance is examined. The effects of VTI on endurance are analyzed. A comparison of the influence of of VTI on muscle endurance with duty cycle is presented. The data reveal that increases in VTI and duty cycle shorten muscle endurance and decreases lengthen it, duty cycle has a greater effect on inspiratory muscle endurance than VTI, and changes in breathing frequency do not effect muscle endurance. I.F.

A86-20004
PLASMA HORMONAL RESPONSES AT GRADED HYPOHYDRATION LEVELS DURING EXERCISE-HEAT STRESS
R. P. FRANCESCONI, M. N. SAWKA, K. B. PANDOLF, R. W. HUBBARD, A. J. YOUNG (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 59, Dec. 1985, p. 1855-1860. refs

The effects of graded levels of hypohydration (3, 5, and 7 percent of body weight) on the response of plasma cortisol (PC), plasma renin activity (PRA), and plasma aldosterone (ALD) to exercise in heat are examined. The experimental conditions, monitoring, and testing of the six heat-acclimated male subjects are described. Graphs revealing the relationship between graded levels of hypohydration, exercise in the heat, and PC, PRA, and ALD levels are presented. IT is observed that hypohydration increases the levels of PC and PRA and exercise in heat increases the ALD level; PRA and ALD correlate with graded intensities of hypohydration through 5 percent hypohydration and PC is increased through 7 percent. It is concluded that both graded level of hypohydration and exercise in the heat increase hormonal levels following heat acclimation. I.F.

A86-20401
THE EFFECTS OF +GZ ON THE CORONARY CIRCULATION - A REVIEW
M. H. LAUGHLIN (Oral Roberts University, Tulsa, OK; USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 5-16. refs
(Contract NIH-HL-26963; NIH-HL-29428)

The interaction of basic coronary physiology and acceleration physiology is analyzed. A review of basic coronary functions is presented; blood is determined by the interaction of resistance to blood flow and the perfusion gradient. The modulation of coronary vascular resistance to blood flow by local metabolic control mechanisms, neural control, and mechanical effects is described. The factors which influence myocardial oxygen consumption and coronary functions during +Gz stress are discussed. During +Gz stress coronary vascular resistance causes a decrease in blood flow reserve nd an increase in coronary blood flow, thereby maintaining an adequte coronary blood flow. Potential pathologic effects on the heart, cardiovascular system, and coronary blood flow due to +Gz exposure are studied. The effects of +Gz stress

on the coronary blood flow of pilots with cardiovascuar disease is investigated. I.F.

A86-20402* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BEDREST-INDUCED PEAK VO2 REDUCTION ASSOCIATED WITH AGE, GENDER, AND AEROBIC CAPACITY
V. A. CONVERTINO, D. J. GOLDWATER, and H. SANDLER (NASA, Ames Research Center, Moffett Field, CA; Arizona, University, Tucson) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 17-22. refs

A study measuring the peak oxygen uptake (V02), heart rate (HR), and exercise tolerance time of 15 men of 55 + or - 2 yr and 17 women of 55 + or - 1 yr after 10 days of continuous bed rest (BR) is presented. The experimental conditions and procedures are described. Following BR a decrease in peak VO2 of 8.4 percent in men and 6.8 percent in women, a reduction in exercise tolerance time by 8.1 percent in men and 7.3 percent in women, and an increse in HR of 4.4 percent and 1.3 percent for men and women, respectively, are observed. These data are compared with data from Convertino et al. (1977) for men 21 + or - 1 yr and women 28 + or - 2yr. It is concluded that BR-induced aerobic deconditioning is independent of age and sex, since the relative decrease in peak V02 in the older and younger subjects and men and women are similar. IF.

A86-20403
COMPARATIVE COLD RESPONSES OF MEN AND WOMEN TO EXTERNAL AND INTERNAL COLD STIMULI
J. A. MANNINO and W. C. KAUFMAN (Wisconsin, University, Green Bay) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 27-30. refs

Experiments which compared the contributions of internal and external cold stimuli on the initiation of horripilation in men and women are studied. The experimental conditions involve five men and five women exposing their legs to 16 C for 20 minutes while wearing perfused vests to maintain torso skin temperture at 34, 30, 26, and 22 C, and following immersion exercising on a bicycle ergometer for 20 min. The relationship between body fat, torso skin temperature, and horripilation episodes for men and women are analyzed. The esopageal and rectal temperatures of men and women for the various torso skin temperatures are recorded. With a decreasing skin temperature a decrease in rectal and esophageal temperature is observed in men; however, in women no change is detected. It is concluded that in men the number of horripilation episodes is inversely related to torso skin temperature and in women horripilation episodes correlate with body. I.F.

A86-20405
CALCIUM ANTAGONISTS IN THE PREVENTION OF MOTION SICKNESS
J. A. LEE, L. A. WATSON, and G. BOOTHBY (Royal Australian Air Force, Institute of Aviation Medicine, Point Cook, Australia) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 45-48. refs

Flunarizine is a calcium antagonist which has proved clinically useful in controlling chronic vertigo. In a double blind crossover trial 10 subjects were used to compare the electronystagmic responses to motion in patients taking flunarizine, prochlorperazine maleate, or placebo. Flunarizine is shown to be a powerful peripherally acting labyrinthine suppressant, with application in the prevention of motion sickness. Flunarizine produces none of the central depressive side effects characteristic of antihistamines and anticholinergics, which are the conventional anti-motion sickness drugs. Author

A86-20406
THE USE OF THORACIC IMPEDANCE FOR DETERMINING THORACIC BLOOD VOLUME CHANGES IN MAN
T. J. EBERT, J. J. SMITH, J. A. BARNEY, D. C. MERRILL, and G. K. SMITH (Wisconsin, Medical College, Milwaukee; USVA, Medical Center, Milwaukee, WI) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 49-53. USVA-supported research. refs
(Contract NIH-HI-27815)

In these studies, strong inferential evidence is provided which suggests that thoracic impedance provides reliable estimates of thoracic blood volume changes in man. There were 24 volunteers studied in four different experiments. The results of these studies are as follows: (1) impedance derived blood volume changes in the calf of man correlate closely with standard estimates of calf blood volume changes made with strain gage plethysmography. (2) There is a close linear relationship between the increase of thoracic impendance and the increase of calf blood volume during head-up tilt, (3) Voluteers who develop syncope during head-up tilt (presumably due to excessive decreases of central blood volume) demonstrate exaggerated increases of thoracic impedance. (4) Decreases in central venous pressure produced by lower body negative pressure are significantly correlated to thoracic impendance increases. Author

A86-20407
AGE, DEGRADED VIEWING ENVIRONMENTS, AND THE SPEED OF ACCOMMODATION
C. L. ELWORTH, C. LARRY, and F. V. MALMSTROM (Boeing Aerospace Co., Seattle, WA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 54-58. refs

Subjects were 35 males in an accommodation experiment which utilized a subjective laser optometer. Seven different age groups, from average age 22-52, were measured on the time to change accommodation from a near to an infinity target. During the experiment, room illumination, time duration of reading at a near distance, and the distance of a near-reading task were varied. Results indicated that the time to accommodate from a near to infinity target varied as a function of age, room illumination, and the distance of the near-reading task. During ideal conditions, older subjects could accommodate nearly as quickly as the younger subjects; however, during degraded viewing conditions, the accommodation time for older subjects increased as much as tenfold. Time to accommodate time to a distance target also increased as much as tenfold. Time to accommodate to a distant target solely as a function of time spent reading at a near distance, regardless of age. In accordance with previous review of aging and military pilots, it is suggested that the time to accommodate may be used as an objective measure of degraded vision as it relates to age. Author

A86-20410
CEREBRAL THROMBOSIS AT ALTITUDE - ITS PATHOGENESIS AND THE PROBLEMS OF PREVENTION AND TREATMENT
S.-Y. SONG, R. OKEDA (Tokyo Medical and Dental University, Japan), T. ASAJI, Y. TANIZAKI (Kakeyu Hospital, Nagano, Japan), T. FUJIMAKI (Tokyo Metropolitan Komagome Hospital, Japan) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 71-76. refs

A86-21097
AN OVERVIEW OF SPACE PHYSIOLOGY AND RELATED EXPERIMENTS ON SPACELAB 1
L. D. CAREN (Santa Clara University, CA) Journal of the Astronautical Sciences (ISSN 0021-9142), vol. 33, Oct.-Dec. 1985, p. 331-340. refs

This paper reviews the current status of research on the physiological effects of space flight. Results from early space flights and the more recent Spacelab 1 Shuttle mission are described. Space adaptation syndrome, previously known as space motion sickness, affects at least half of those who fly in space, and countermeasures have not been totally effective. Other physiological effects of space flight include loss of muscle mass

and bone mass, changes in the blood, alterations in the function of the heart and blood vessels, and some decrease in the vital capacity of the lungs. Many hormonal changes occur which are not fully understood. Although problems are described, the mechanisms underlying physiological changes are not known. We have only begun to learn whether life can successfully adapt to long periods of time in space. Author

A86-21452
MECHANICAL RESISTANCE OF ERYTHROCYTES AND OXYGEN MASS TRANSPORT IN HYPOXIC STATES DUE TO DIFFERENT CONDITIONS [MEKHANICHESKAIA REZISTENTNOST' ERITROTSITOV I MASSOPERENOS KISLORODA PRI GIPOKSICHESKIKH SOSTOIANIIAKH RAZNOGO GENEZA]
A. A. NENASHEV, I. M. TISHCHENKO, and Z. A. SHIDOV (Kabardino-Balkarskii Gosudarstvennyi Universitet, Nalchik, USSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, Nov.-Dec. 1985, p. 650-657. In Russian. refs

Clinical data are presented concerning the mechanical resistance of erythrocytes in patients suffering from bronchial asthma, chronic pneumonia, and chronic coronary insufficiency. Consideration is given to the effects of erythrocyte aging, changes in functional activity, and the ability of erythrocytes to transport oxygen. A mathematical model of erythrocyte motion through capillaries of different diameters is described and a formula for calculating the degree of oxygen shunting by inactive erythrocytes is given. I.H.

A86-21453
THE DIAPHORETIC REFLEX IN A COMPLEX OF METHODS FOR ESTIMATING OPERATOR EFFICIENCY [POTOOTDELITEL'NYI REFLEKS V KOMPLEKSE METODOV OTSENKI RABOTOSPOSOBNOSTI OPERATORA]
P. P. SLYNKO, L. I. BUKVAREVA, S. V. ZAPOROZHETS, and P. M. ONISHCHENKO (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 31, Nov.-Dec. 1985, p. 678-682. In Russian. refs

A method for measuring the electrodermal characteristics associated with the stress induced diaphoretic reflex has been developed. The method is intended for use in evaluating the functional conditions of a human operator in monotonous work conditions. A general description of the diaphoretic skin sensor is given, and experimental results are presented concerning the accuracy of the method in comparison to conventional electrodermal sensing methods. It is shown that, in contrast to conventional methods, the present sensing method offers a highly reliable measure of skin response over extended periods of monotonous work. I.H.

A86-22524
EXPERIMENTAL VALIDATION OF TRAINING REGIME AND A MONITORING METHOD CONNECTED WITH ACCELERATED ADAPTATION TO HEAT [EKSPERIMENTAL'NOE OBOSNOVANIE REZHIMA TRENIROVOK I METODA KONTROLIA PRI USKORENNOI ADAPTATSII K ZHARE]
IU. A. IVANOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Nov. 1985, p. 47-49. In Russian.

A86-22525
INVESTIGATION OF THE FUNCTIONAL CONDITION OF PILOTS IN THE CASE OF OXYGEN BREATHING UNDER EXCESS PRESSURE [ISSLEDOVANIE FUNKTSIONAL'NOGO SOSTOIANIIA ORGANIZMA LETCHIKOV PRI DYKHANII KISLORODOM POD IZBYTOCHNYM DAVLENIEM]
L. I. STARIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Nov. 1985, p. 50-53. In Russian. refs

It is shown that the general stress reaction arising in oxygen breathing under excess pressure leads, in certain cases, not to a reduction but to an increase in the general and regional volume hemodynamics, accompanied by venous congestion and elevated intracranial pressure. Acute disturbances of brain circulation under excess oxygen pressure can lead to syncopal states with a vasovagal character. B.J.

A86-22532
INDIVIDUAL AND TYPOLOGICAL FUNCTIONAL PROPERTIES OF THE SYMPATHOADRENAL SYSTEM AS A PROGNOSTIC INDEX OF THE FUNCTIONAL STATE OF AN ORGANISM IN COMPLEX ENVIRONMENTAL CONDITIONS [INDIVIDUAL'NO-TIPOLOGICHESKIE OSOBENNOSTI FUNKTSIONIROVANIIA SIMPATOADRENALOVOI SISTEMY KAK PROGNOSTICHESKII POKAZATEL' FUNKTSIONAL'NOGO SOSTOIANIIA ORGANIZMA V SLOZHNYKH USLOVIIAKH SREDY]
N. A. NEIZHMAKOVA and L. M. SHAFRAN (Nauchno-Issledovatel'skii Institut Gigieny Vodnogo Transporta, Odessa, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 903-910. In Russian. refs

The biochemical and physiological reactions of the sympathoadrenal system (SAS) were studied in 137 crewmen during oceanic voyages. Changes in biochemical SAS criteria (e.g., dihydroxyphenylalanine, catecholamines, etc.) and physiological SAS criteria (heart beat, attention and memory indices and mental activity) in conditions of everyday routine and during periodic stress were evaluated. Two extreme ('first' and 'second') and two intermediate SAS functional types were identified and defined according to the measured criteria. While individuals of the first type performed better in stressful and extreme working situations, the individuals of the second type did better during the monotonous routine conditions. Testing criteria are suggested for selecting future crewmembers for different navigation activities. I.S.

A86-22533
DISTURBANCE OF THE MULTIPERIODIC SYNCHRONIZATION OF THE HEART-BEAT AND RESPIRATORY RHYTHMS AFTER TRANSMERIDIAN FLIGHTS THROUGH THREE TIME ZONES [NARUSHENIE KRATNOPERIODICHESKOI SINKHRONIZATSII RITMOV SERDTSEBIENIIA I DYKHANIIA POSLE TRANSMERIDIANNOGO PERELETA CHEREZ TRICHASOVYKH POIASA]
A. A. PUTILOV (Institut Fiziologii, Novosibirsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 915-922. In Russian. refs

The values of individual multiple (most often 4/1) heart-beat frequency (HBF) to respiratory frequency (RF) ratios observed during normal nocturnal sleep are known to be disturbed after periods of night-time shifts or periods of alternating short sleep/short night-time work. The daytime HBF/RF ratios most usually approach the 3/1 value. The night and daytime ratios can vary from 5/1-2/1 (integral) to 5/2-3/2 (fractional) values. This paper reports postflight desynchronization of the HBF/RF biorhythms observed in individuals who have flown through one or three time-zones. In the case of the one-hr zone, the rhythm deviations were small and disappeared after the first two post-flight days; a small increase in variation in the circadian rhythm was observed. After the 3-hr-zone passage, internal desynchronization was observed during the first ten postflight days, with continued shift in deviations from integral to fractional HBR/RF ratios during the total 10-day-long adaptation period, reaching a maximum after the first 2-3 postflight days. I.S.

A86-22534
THE RISK OF ARTERIAL HYPERTENSION AND THE FEATURES OF FUNCTIONAL BRAIN ASYMMETRY IN WORKERS EMPLOYED IN REGULARLY REPEATED EXPEDITION-TYPE WORK [RISK ARTERIAL'NOI GIPERTENZII I OSOBENNOSTI FUNKTSIONAL'NOI ASIMMETRII MOZGA U RABOCHIKH VAKHTY DAL'NEGO PLECHA]
V. P. LEUTIN and E. I. NIKOLAEVA (Institut Fiziologiia, Novosibirsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 923-926. In Russian. refs

Arterial blood pressure and parameters of functional sensorimotor asymmetry were measured in 306 workers employed in oil-field work that involved regularly repeated long-distance flight

travel, with passages through several time zones, to and from the work location. Day-time-shift drivers who lived permanently at the residential base were used as controls. The traveling workers displayed increased percentages (relative to the control group) of lefthanded and ambidextrous individuals. Moreover, in the traveling worker group, arterial hypertension occurred primarily in righthanded individuals and in those with mixed parameters of functional asymmetry (no such connection was registered in the control group). On the other hand, arterial hypertension in the traveling lefthanded and ambidextrous individuals remained at the levels of the respective control groups. I.S.

A86-22535
CHANGES IN THE HEART RATE AND IN THE CEREBRAL VASCULAR TONUS AFFECTED BY ALTERNATING PHYSICAL AND MENTAL LOADS [IZMENENIE CHASTOTY SERDECHNYKH SOKRASHCHENII I TSEREBRAL'NOGO SOSUDISTOGO TONUSA POD VLIIANIEM CHEREDUIUSHCHIKHSIA FIZICHESKIKH I UMSTVENNYKH NAGRUZOK]
I. A. LEBEDEV (Iaroslavskii Gosudarstvennyi Pedagogicheskii Institut, Yaroslavl, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 934-937. In Russian. refs

A86-22536
THE EFFECT OF PROLONGED PHYSICAL WORK AT THE LEVELS OF SUBMAXIMAL AND EXTREME INTENSITY UPON THE MASS TRANSFER AND UTILIZATION OF OXYGEN [VLIIANIE DLITEL'NOI FIZICHESKOI RABOTY SUBMAKSIMAL'NOI I EKSTREMAL'NOI MOSHCHNOSTI NA MASSOPERENOS I UTILIZATSIIU KISLORODA]
IU. K. UDOVICHENKO, I. A. MERKUREV, and V. G. TKACHUK (Kievskii Gosudarstvennyi Institut Fizicheskoi Kul'tury, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 938-944. In Russian. refs

A86-22537
THE EFFECT OF DIFFERENT REGIMENS OF RUNNING TRAINING ON THE PHYSICAL WORK CAPACITY AND BLOOD PLASMA LIPIDS AND LIPOPROTEINS IN UNTRAINED MALE AND FEMALE STUDENTS [VLIIANIE RAZNYKH REZHIMOV BEGOVOI TRENIROVKI NA FIZICHESKUIU RABOTOSPOSOBNOST' LIPIDY I LIPOPROTEIDY PLAZMY KROVI U NETRENIROVANNYKH STUDENTOK I STUDENTOV]
T. A. IURIMIAE, A. A. VIRU, E. A. VIRU, IA. I. PEDASTE, and T. O. PETERSON (Tartuskii Gosudarstvennyi Universitet, Tartu, Estonian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 945-951. In Russian. refs

A86-22538
HEAT ADAPTATION DURING TRAINING BY GRADED HYPERTHERMIA [O TEPLOVOI ADAPTATSII PRI TRENIROVKAKH POSREDSTVOM DOZIROVANNOI GIPERTERMII]
IU. A. IVANOV and L. A. KOROLEV (Gosudarstvennyi Institut Fizicheskoi Kul'tury, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 952-956. In Russian. refs

Development of adaptation to a hot climate was studied in 60 nonacclimatized subjects trained by periodic exposures to hyperthermia. The subjects' functional status was evaluated according to the levels of work capacity and thermal stress, electrocardiogram analysis, sweat losses, and the analysis of psychoemotional parameters. During the first 4-5 days of training, a deterioration of all measured functions was observed. However, after 9-10 days, the physical work capacity, cardiac function, and psychoemotional parameters returned to normal. After 13-15 days of training, the work capacity increased above control by 30.5 percent. I.S.

A86-22539
THE DYNAMICS OF THE HUMAN ESTIMATION OF IMAGE SIZE AND ITS NEUROPHYSIOLOGICAL CORRELATES [DINAMIKA OTSENKI CHELOVEKOM RAZMERA IZOBRAZHENIIA I EE NEIROFIZIOLOGICHESKIE KOORDINATY]
N. B. KOSTELIANETS and V. M. KAMENKOVICH (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 984-988. In Russian. refs

Temporal changes in the estimation of the size of a contour image (a ring) and a textured image (a rectangular grating) were studied, increasing the interstimulus interval (II) between a stimulus and a masking field (represented by either randomly placed multisized rings or randomly chaotically oriented line segments) from 5 to 150 msec. When a ring-type masking mesh was used, all subjects exhibited an initial tendency to overestimate the size of a ring or a rectangle. When a line-segment mesh was used to mask the images, the same subjects could be divided into two groups: those who overestimated both ring and textured images at the minimal IIs, and those who tended to underestimate the same images; when the II was lengthened, the estimation tendencies were reversed respectively. These results are discussed in connection with the results of earlier analyses of neuronal impulses in the visual cells of the cat. I.S.

A86-22540
CYTOCHEMICAL STUDIES OF BLOOD LYMPHOCYTES IN THE DIAGNOSIS AND FORECASTING OF CHANGES IN THE FUNCTIONAL STATUS OF ATHLETES [TSITOKHIMICHESKOE ISSLEDOVANIE LIMFOTSITOV KROVI V DIAGNOSTIKE I PROGNOZIROVANII IZMENENII FUNKTSIONAL'NOGO SOSTOIANIIA SPORTSMENOV]
A. S. IANOVSKAIA (Kievskii Gorodskoi Vrachebno-Fizkul'turnyi Dispanser, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1001-1006. In Russian. refs

Assays of enzymatic activities of succinate (SDH), lactate (LDH), and malate (MDH) dehydrogenases; mitochondrial and cytoplasmic alpha-glycerophosphate dehydrogenases (m-GPDH and c-GPDH); and other blood factors were performed on 260 runners (aerobic work) and 36 cyclists (anaerobic work). Aerobic work caused two types of reactions: (1) increases in SDH, m-GPDH, and c-GPDH and a decrease in LDH in long-distance runners; and (2) increases in m-GPDH, and c-GPDH with no changes in SDH and LDH in sprinters. Anaerobic work led to moderate increases in SDH, LDH, and MDH and large increases in m-GPDH and c-GPDH. Long-term observation of individual athletes disclosed signs of stress syndrome: increases in rest levels of LDH, m-GPDH, and c-GPDH and decreased SDH; and decreases in post-exercise levels of LDH, SDH, m-GPDH, and c-GPDH. These exercise-caused changes and the adaptation reactions in athletes correspond to the reactions that were observed (Ianovskaia, 1981) in workers exposed to unfavorable environments. I.S.

A86-22541
THERMOREGULATION IN MAN UNDER THERMAL STRESS [KHARAKTERISTIKA TERMOREGULIATSII CHELOVEKA PRI TEPLOVOI NAGRUZKE]
A. L. RESHETIUK (Institut Gerontologii, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1012-1019. In Russian. refs

Regulation of thermostability during exposure to heat stress (work in a thermoregulated chamber at 35.5 C and 90-100 percent humidity) was studied in healthy workers of deep coal mines and in college students. The heart beat rate (HBR), arterial blood pressure, axillary and skin temperatures, and other parameters of thermostability were measured at the end of 10-min-long work and rest periods (six each) in the chamber. Five physiological types were recognized on the basis of HBR measurements: I, the lowest stable; II, the low stable; III, the low increasing; IV, the high stable; and V, the high increasing, which also differed in their other stress and thermostability parameters. Type I consisted exclusively of miners, while type V consisted of nonadapted

students. Formulas were developed for calculating thermostability and endurance levels on the basis of indicators of stress exposure, HBR, and body temperature. I.S.

A86-22542
CORRELATION BETWEEN THE ARTERIAL BLOOD PRESSURE, THE PULMONARY ARTERY PRESSURE, AND CENTRAL VENOUS PRESSURE [VZAIMOSVIAZ' ARTERIAL'NOGO DAVLENIIA, DAVLENIIA V LEGOCHNOI ARTERII I TSENTRAL'NOGO VENOZNOGO DAVLENIIA]
V. E. KATKOV, V. V. RUMIANTSEV, and V. V. CHESTUKHIN Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1026-1028. In Russian.

Arterial pressure (AP), pulmonary artery pressure (PPA), central venous pressure (CVP), minute volume, and cardiac index (CI) were measured in healthy men (at rest) with implanted pulmonary and brachial artery catheters. In addition, CVP and PPA were measured continuously in men exposed to negative pressure on the lower half of the body (NPLB). No correlation was found between CVP on one hand and CI, systolic (s) AP, diastolic (d) AP and medial (m) AP on the other. A direct linear relationship was found between d-AP and CI, and m-AP and CI. The PPA and CVP correlated linearly in both resting subjects and in subjects exposed to NPLB. I.S.

A86-22543
CHANGES IN THE BLOOD ELECTRIC CONDUCTIVITY CAUSED BY BODY IMMERSION [IZMENENIE ELEKTROPROVODNOSTI KROVI PRI PREBYVANII ORGANIZMA V USLOVIIAKH IMMERSII]
V. G. KOZLOVA and E. A. ALEKSANDROVA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1028-1030. In Russian. refs

Reliability of electric conductivity measurements for the estimation of body hydration levels was evaluated in 12 healthy men submerged (in horizontal position) by the method of 'dry' immersion (Shulzhenko, 1975) for periods of 7 days. Specific electric resistance (SER) of blood was measured by the method of Khasin et al. (1981), concentrations of Na(+) and K(+) in blood in urine were measured photometrically, and the daily intakes and losses of Na and liquid were monitored to estimate net losses or gains. Net losses of Na and liquid increased dramatically after the first 1.5 hr of immersion, and net liquid loss continued during all 7 days of immersion, although on lower than initial levels (Na losses stopped after 3 days). The SER increased by 18-20 percent in the first 24 hr and continued to increase, although at a lower rate, during the 7-day immersion period. While SER and dehydration levels correlated linearly, no correlation was found between SER and other measured factors, such as Na concentration and erythrocyte count. I.S.

A86-22544
THERMOREGULATORY REACTIONS TO CHILLING IN ICE-COLD WATER IN FANS OF WINTER SWIMMING [TERMOREGULIATORNYE REAKTSII NA OKHLAZHDENIE V LEDIANOI VODE U LIUBITELEI ZIMNEGO PLAVANIIA]
P. V. LAZARENKO, T. G. SIMONOVA, and M. A. IAKIMENKO (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1030-1032. In Russian. refs

A86-22545
THE DEPENDENCE OF THROMBOELASTOGRAPHIC INDICES IN HEALTHY SUBJECTS ON GEOMAGNETIC-FIELD CONDITIONS [ZAVISIMOST' TROMBOELASTOGRAFICHESKIKH POKAZATELEI U ZDOROVYKH LITS OT SOSTOIANIIA GEOMAGNITNOGO POLIA]
K. P. OMAROVA, ZH. S. SUNDETOV, and K. U. KASENOV (Aktiubinskii Gosudarstvennyi Meditsinskii Institut, Aktyubinsk, Kazakh SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 11, Nov.-Dec. 1985, p. 1035, 1036. In Russian. refs

A86-22549
THE ELECTROKINETIC PROPERTIES OF CELL NUCLEI IN THE HUMAN BUCCAL EPITHELIUM IN CONDITIONS OF MOTION SICKNESS AND HYPOXIA [ELEKTROKINETICHESKIE SVOISTVA KLETOCHNYKH IADER BUKKAL'NOGO EPITELIIA CHELOVEKA V USLOVIIAKH GIPOKSII I PRI BOLEZNI DVIZHENIIA]
E. I. KORZUN, V. G. SHAKHBAZOV, E. S. MAILIAN, T. V. KOLUPAEVA, and E. A. KOVALENKO Patologicheskaia Fiziologiia i Eksperimental'naia Terapiia (ISSN 0031-2991), Nov.-Dec. 1985, p. 63-66. In Russian. refs

The electrophoretic mobility of human buccal epithem cell nuclei was studied before and after training in a hypoxic pressure chamber under angular and precessional accelerations. It is found that, in the absence of training, hypoxia can lead to the inhibition of electrophoretic mobility in the cell nuclei; however, three days of training effectively mitigated the inhibitory effect of acute hypoxia. A reverse correlation is established between the initial resistance to hypoxia among the human subjects and the degree of inhibition of the electrokinetic properties of the cell nuclei. The effects of Coriolis loadings and precessional accelerations were characterized by a significant decrease in the percentage of mobile cell nuclei in the buccal epithelium. I.H.

A86-22567
CALCULATION METHOD FOR DETERMINING ENERGY EXPENDITURES FOR OPERATORS [RASCHETNYI SPOSOB OPREDELENIIA ENERGOTRAT U OPERATOROV]
E. A. NIKOLAEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1985, p. 44-46. In Russian.

Mathematical relationships and a calculation method are presented for determining the energy expenditures of human operators working in a waiting mode. The method has been developed on the basis of relationships between lung ventilation and energy consumption as well as between lung-ventilation volume and heart rate. B.J.

A86-22568
POSSIBLE EFFECT OF HYPERLIPEMIA ON THE DEVELOPMENT AND COURSE OF ATHEROSCLEROSIS IN FLIGHT PERSONNEL [O VOZMOZHNOM VLIIANII GIPERLIPIDEMII NA RAZVITIE I TECHENIE ATEROSKLEROZA U LITS LETNOGO SOSTAVA]
E. G. MUKHAMEDOV, L. P. PUKACH, O. K. VEKLICH, B. A. ARSENTEV, and A. V. SOROKINA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1985, p. 47-49. In Russian. refs

Both labile and stable hyperlipemia are shown to be factors that facilitate the development of atherosclerosis in flight personnel. It is noted that periodic biochemical testing makes it possible to detect labile hyperlipemia and to develop a set of therapeutic measures. Dynamic indices of lipid metabolism yield additional information about the development of atherosclerosis. B.J.

A86-22569
HEMATOLOGICAL CRITERIA OF THE HEAT ADAPTATION OF SEAMEN [GEMATOLOGICHESKIE KRITERII TEPLOVOI ADAPTATSII ORGANIZMA MORIAKOV]
O. P. LOMOV and N. N. PLAKHOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Oct. 1985, p. 50-53. In Russian. refs

The efficiency of the preliminary heat adaptation (PHA) of seamen was assessed on the basis of hematological data, and the functional condition of leukocytes in seamen on long voyages in tropical regions was investigated. The hematological studies led to the conclusion that PHA leads to the more rapid development of resistance to high air temperature. B.J.

A86-22664* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MECHANISM FOR NEGATIVE WATER BALANCE DURING WEIGHTLESSNESS AN HYPOTHESIS
J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Jan. 1986, p. 60-62. refs

The mechanism for the apparent decrease in body fluid volume in astronauts during spaceflight remains obscure. The widespread postulate that the hypohydration is the result of the Henry-Gauer reflex, a diuresis caused by inhibition of vasopressin secretion resulting from increased left and perhaps right atrial (central) venous pressure, has not been established with direct measurements on astronauts. An hypothesis is proposed to account for fluid-electrolyte shifts during weightlessness. A moderate but transient increase in central venous pressure occurs when orbit is entered that is insufficient to activate the Henry-Gauer reflex but sufficient to stimulate the release of atrial natriuretic peptides. Increased sodium excretion would facilitate some increased urinary water loss. The resulting relatively dilute plasma and interstitial fluids would cause fluid to shift into the cellular space, resulting in edema in the head and trunk and inhibition of thirst and drinking. Thus, the negative water balance in astronauts would be caused by a gradual natriuresis and diuresis coupled with reduced fluid intake. Author

A86-22665
EFFECTS OF DETRAINING ON CARDIOVASCULAR RESPONSES TO EXERCISE - ROLE OF BLOOD VOLUME
E. F. COYLE, M. K. HEMMERT, and A. R. COGGAN (Texas, University, Austin) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Jan. 1986, p. 95-99. Research supported by the American Heart Association. refs

An increase in stroke volume (SV) during exercise represents a major adaptation to endurance training. It has been found that when highly trained people stop training, they display a large decline in SV during upright exercise after only 12 days of inactivity, while little further decline in SV occurs after three months of inactivity. The present study had the objective to determine the extent to which a reduction in blood volume contributes to the rapid decline in SV during detraining. The cardiovascular responses to submaximal and maximal exercise were measured in eight men when trained and then again after 2-4 weeks of inactivity. The period of inactivity resulted in a decline in blood volume. Thus, the findings indicate that the decline in SV during submaximal upright exercise following a few weeks of detraining is largely due to a decline in blood volume. G.R.

A86-22666
CARDIORENAL-ENDOCRINE RESPONSES TO HEAD-OUT IMMERSION AT NIGHT
K. SHIRAKI, N. KONDA, S. SAGAWA, J. R. CLAYBAUGH, and S. K. HONG (University of Occupational and Environmental Health, Kitakyushu, Japan; U.S. Army, Tripler Army Medical Center, Honolulu, HI; New York, State University, Buffalo) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Jan. 1986, p. 176-183. refs
(Contract NIH-HL-28542)

Head-out immersion (HOI) induces a cephalad shift of circulating blood, which is followed by diuresis, natriuresis, and kaliuresis. Krishna and Danovitch (1983) concluded that in addition to the well-described diurnal variations in electrolyte excretion, there are circadian variations in the responsivity of volume-regulatory mechanisms. The present investigation was conducted in hydropenic subjects with the objective to reevaluate the circadian change in renal responses to HOI, and to directly assess the extent of HOI-induced central blood pooling by determining the cardiac output during day and night. Another aim of the investigation was to gain additional insight into the circadian changes in endocrine responses to HOI by determining both the plasma level and urinary excretion of antidiuretic hormone (ADH) and aldosterone. Six healthy male medical students were employed as subjects. G.R.

A86-22711* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LASER ABLATION OF HUMAN ATHEROSCLEROTIC PLAQUE WITHOUT ADJACENT TISSUE INJURY
W. S. GRUNDFEST, F. LITVACK, J. S. FORRESTER, T. GOLDENBERG, H. J. C. SWAN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena; Cedars-Sinai Medical Center; California, University, Los Angeles) et al. American College of Cardiology, Journal (ISSN 0735-1097), vol. 5, April 1985, p. 929-933. Research supported by the Cedars-Sinai Medical Center and NASA. refs

Seventy samples of human cadaver atherosclerotic aorta were irradiated in vitro using a 308 nm xenon chloride excimer laser. Energy per pulse, pulse duration and frequency were varied. For comparison, 60 segments were also irradiated with an argon ion and an Nd:YAG laser operated in the continuous mode. Tissue was fixed in formalin, sectioned and examined microscopically. The Nd:YAG and argon ion-irradiated tissue exhibited a central crater with irregular edges and concentric zones of thermal and blast injury. In contrast, the excimer laser-irradiated tissue had narrow deep incisions with minimal or no thermal injury. These preliminary experiments indicate that the excimer laser vaporizes tissue in a manner different from that of the continuous wave Nd:YAG or argon ion laser. The sharp incision margins and minimal damage to adjacent normal tissue suggest that the excimer laser is more desirable for general surgical and intravascular uses than are the conventionally used medical lasers. Author

N86-16641# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
MODEL EVALUTION OF SPINAL INJURY LIKELIHOOD FOR VARIOUS EJECTION SYSTEM PARAMATER VARIATIONS
E. PRIVITZER *In* Shock and Vibration Information Center The Shock and Vibration Bulletin 55, Part 3 p 99-115 Jun. 1985 refs
Avail: SVIC, Code 5804, Naval Research Lab., Washington, D.C. 20375 CSCL 06S

The Air Force Aerospace Medical Research Laboratory's (AFAMRL) Head-Spine Model (HSM), a discrete element model of the human head-spine structure, is described. This model was developed to provide a mathematical means for the investigation of three-dimensional head-spine structure dynamic response and injury likelihood in impact environments and to serve as a design tool for the evaluation of crewmember-ejection system impact interactions. Results are presented from a study which involved the use of the HSM to evaluate the effects of variations in certain ejection system parameters on head-spine structure ejection response and injury likelihood. Author

N86-16882# Joint Publications Research Service, Arlington, Va.
ADVANCES IN NERVE CELL RESEARCH
Y. CHAZOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UB-85-025) p 2-4 10 Dec. 1985 Transl. into ENGLISH from Pravda (Moscow), 16 Aug. 1985 p 6
Avail: NTIS HC A05/MF A01

All excitability which is dependent on the existence of molecular structure of the cell membrane, the ion channels, is discussed. The systems operation of living organisms depends on the fine coordination of the ion channel action. Ion channels contribute to initiation of cardiac and smooth muscle contraction, endocrine secreation of enyzmes and hormones, cell growth and division, and regulation of cell metabolism. Approches towards the development of methods to control the action of ion channels and the function of nerve cells are identified. E.A.K.

N86-16887 Pennsylvania Univ., Philadelphia.
TRANSPORT OF ARTERIAL BLOOD GATES THROUGH HUMAN SKIN Ph.D. Thesis
J. E. BAUMGARDNER 1985 149 p
Avail: Univ. Microfilms Order No. DA8515346

The physiology of the transport of arterial blood gases through human skin has important applications in non-invasive monitoring.

A simple analytical model has been developed that relates flux of arterial gas through skin to arterial tension, skin blood flow, skin diffusional resistance, and skin metabolism. In addition, a mass specreal approach has been devised to accurately measure gas flux through human skin. Flux of helium and oxygen through human skin at constant temperature is well-described by the simple linear analytical model. Increasing surface temperature in the range 33-43 C results in a much larger increase in oxygen efflux than in helium efflux for intact skin. Skin perfusion was approximated from helium efflux for skin that had been stripped with cellophane tape. Estimates of skin perfusion compare favorably to previously reported values obtained by other techniques. Values for skin perfusion were combined with helium and oxygen data to calculate skin diffusion conductance. Dissert. Abstr.

N86-16888* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Nov. 1985 74 p
(NASA-SP-7011(277); NAS 1.21:7011(277)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 205 reports, articles, and other documents introduced into the NASA scientific and technical information system in October 1985. Author

N86-16889*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ANIMAL STUDIES ON SPACELAB-3
C. SCHATTE, R. GRINDELAND, P. CALLAHAN, G. FUNK, W. LENCKI (Matsco, Valley Forge, Pa.), and W. BERRY Jan. 1986 7 p
(NASA-TM-88212; A-86113; NAS 1.15:88212) Avail: NTIS HC A02/MF A01 CSCL 06E

The flight of two squirrel monkeys and 24 rates on Spacelab-3 was the first mission to provide hand-on maintenance on animals in a laboratory environment. With few exceptions, the animals grew and behaved normally, were free of chronic stress, and differed from ground controls only for gravity-dependent parameters. One of the monkeys exhibited symptoms of space sickness similar to those observed in humans, which suggests squirrel monkeys may be good models for studying the space-adaptation syndrome. Among the wide variety of parameters measured in the rats, most notable was the dramatic loss of muscle mass and increased fragility of long bones. Other interesting rat findings were those of suppressed interferon production by spleen cells, defective release of growth hormone by somatotrophs, possible dissociation of circadian pacemakers, changes in hepatic lipid and carbohydrate metabolism, and hypersensitivity of marrow cells to erythopoietin. These results portend a strong role for animals in identifying and elucidating the physiological and anatomical responses of mammals to microgravity. Author

N86-16890*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECTS OF 9-HOUR TIME ZONE CHANGES ON FATIGUE AND CIRCADIAN RHYTHMS OF SLEEP/WAKE AND CORE TEMPERATURE
P. H. GANDER, G. MYHRE, R. C. GRAEBER, H. T. ANDERSEN, and J. K. LAUBER Dec. 1985 38 p refs
(NASA-TM-88197; A-86057; NAS 1.15:88197) Avail: NTIS HC A03/MF A01 CSCL 06S

Physiological and psychological disruptions caused by transmeridian flights may affect the ability of flight crews to meet operational demands. To study these effects, 9 Royal Norwegian Airforces P3-Orion crewmembers flew from Norway to California (-9 hr), and back (+9 hr). Rectal temperature, heart rate and wrist activity were recorded every 2 min, fatigue and mood were rated every 2 hr during the waking day, and logs were kept of sleep times and ratings. Subjects also completed 4 personality inventories. The time-zone shifts produced negative changes in mood which persisted longer after westward flights. Sleep quality (subjective and objective) and duration were slightly disrupted (more after eastward flights). The circadian rhythms of sleep/wake and temperature both completed the 9-hr delay by day 5 in California, although temperature adjusted more slowly. The size of the delay shift was significantly correlated with scores on extraversion and achievement need personality scales. Response to the 9-hr advance were more variable. One subject exhibited a 15-hr delay in his temperature rhythm, and an atypical sleep/nap pattern. On average, the sleep/wake cycle (but not the temperature rhythm), completed the 9-hr advance by the end of the study. Both rhythms adapted more slowly after the eastward flight. Author

N86-16891# Department of Energy, Washington, D. C.
IMPROVED MONOCLONAL ANTIBODIES TO HALODEOXYURIDINE Patent Application
M. VANDERLAAN (Lawrence Livermore National Lab., Calif.), F. A. DOLBEARE (Lawrence Livermore Lab., Calif.), J. W. GRAY (Lawrence Livermore Lab., Calif.), and C. B. THOMAS, inventors (to DOE) (Lawrence Livermore Lab., Calif.) 18 Oct. 1983 33 p (Contract W-7405-ENG-48)
(DE85-017764; US-PATENT-APPL-SN-542967) Avail: NTIS HC A03/MF A01

The development, method of production, characterization and methods of use of two hybridomas, CldU-1 (ATCC Accession No. HB-8321) and CldU-2 (ATCC Accession No. HB-8320), are described. These secrete IgG1(K) immunoglobulins react with halodeoxyuridine (HdU or halodU) such as bromo, chloro, fluoro and iodo deoxyuridine (BrdU, CldU, FdU and IdU), whether these are free in solution or incorporated into single stranded DNA in whole cells. The antibodies do not react with naturally occurring free nucleic acids or with deoxyribonucleic acid (DNA) or ribonucleic acid (RNA) polymers. These antibodies are suitable for use in enzyme immunoassays for free CldU, FdU, IdU and BrdU and for detecting cells with these nucleotides incorporated into them. The nomoclonal antibodies are useful in the detection of the sensitivity of tumor cells to specific chemotherapeutic agents, in the measurement of the rate of cellular DNA synthesis, in the measurement of the rate of proliferation of normal and malignant cells and in the detection of HPRT deficiency in cells. DOE

N86-16892# Department of Energy, Washington, D. C. Office of Energy Research.
HEALTH AND ENVIRONMENTAL EFFECTS OF COMPLEX CHEMICAL MIXTURES
1985 117 p Preceedings of Conference held in Chicago, Ill., 17 Jun. 1985
(DE85-016336; CONF-8506155) Avail: NTIS HC A06/MF A01

The Office of Health and Environmental Research (OHER) of the Department of Energy supports a broad long-term research program on human health and environmental effects from potential exposure to energy-related complex chemical mixtures. The program seeks basic mechanistic data on the effects of complex mixtures at the cellular, molecular, and whole animal levels to aid in predicting human health effects and seeks ecological data on biological and physical transformations in the mixtures, concentrations of the mixtures in various compartments of the environment, and potential routes for human exposure to these mixtures (e.g., food chain). On June 17 to 18, 1985, OHER held its First Annual Technical Meeting on the Complex Chemical Mixtures Program in Chicago, Ill. The primary purpose of the meeting was to enable principal investigators to report the research status and accomplishments of ongoing complex chemical mixture studies supported by OHER. To help focus future research directions round table discussions were conducted. DOE

N86-16893# New York Univ., New York. Inst. of Environmental Medicine.
IN VIVO DETECTION, LOCALIZATION AND MEASUREMENT OF RADIONUCLIDES IN MAN: A DETECTION SYSTEM FOR THE LOCALIZATION AND MEASUREMENT OF SMALL AMOUNTS OF PHOTON EMITTERS Final Report
G. R. LAURER 1 Aug. 1985 41 p
(Contract DE-AC02-78EV-04957)
(DE85-017601; DOE/EV-04957/5; COO-4957-5) Avail: NTIS HC A03/MF A01

A new detector has been devised which, by providing a significant increase in geometric counting efficiency, allows a concurrent reduction in the amount of radioactivity needed to produce an image of the deposition site(s) of radionuclides in humans and/or experimental animals. Consisting of four wedgeshaped NaI(Tl) crystals in a unique geometrical arrangement, the crystals themselves function as the collimator generally employed in radionuclide imaging applications. The four crystals, when coupled, become a 4-crystal unit detector; joined so their active faces form the silhouette of a pyramid. The outside, vertically oriented, rectangular faces of each crystal are placed back-to-back with those of adjoining detectors. Thus, small or large arrays of the 4-crystal unit detectors may be assembled. In practice, the array of detectors will be moved in fixed, discrete steps over the source of radiation to be imaged. As a result of its shape, each count obtained from each crystal at each counting position is different, relative to its position above the source. The array of counts obtained in this manner is the raw spatial information. They are used in a system of linear, simultaneous equations which relate the position of the detectors to the counts obtained at each position. The solution of these equations - utilizing the predetermined point-source-response (PSR) function of the crystals - yields a two-dimensional image of the deposition site of the radioactivity.
DOE

N86-16894# Societe Nationale Industrielle Aerospatiale, Paris (France).
CHARACTERIZATION OF YAG LASERS FOR OPHTHALMOLOGIC APPLICATIONS [CARACTERISATION DES LASERS YAG POUR L'OPHTALMOLOGIE]
A. P. JOSSE 1985 5 p In FRENCH Presented at Intern. Seminar on Caracterisation des LASERS YAG pour l'Ophtalmol., Lorient, France, 5-6 Sep. 1985
(SNIAS-852-430-107) Avail: NTIS HC A02/MF A01

The shock waves produced in a water medium by a YAG laser source are measured and visualized. The human eye optical system is simulated by an experimental set-up. A pulsed YAG laser with up to 1 J power is used. The time and space visualizations are based on the variation of the optical refraction index in the water. Time visualization by the Schlieren method allows measuring of the propagation velocity of the shock wave at various distances from the plasma initiation point. Photographs are included. Pressure is evaluated from velocity following the finite difference method.
Author (ESA)

N86-16895# Health Effects Research Lab., Research Triangle Park, N. C.
BIOLOGICAL EFFECTS OF ELECTRIC FIELDS
R. D. PHILLIPS Aug. 1985 31 p
(PB85-243467; EPA-600/D-85-174) Avail: NTIS HC A03/MF A01 CSCL 05R

Research concerned with the biological consequences of exposure to extremely-low-frequency radiation is reviewed. Epidemiological and clinicial studies and an examination of results of studies using experimental animals are summarized. Current concepts on possible mechanisms and future directions of research are presented. GRA

N86-16896# Resources for the Future, Inc., Washington, D. C.
AMBIENT OZONE AND HUMAN HEALTH: AN EPIDEMIOLOGICAL ANALYSIS, VOLUME 1 Final Report
P. R. PORTNEY and J. MULLAHY Aug. 1985 327 p refs
(Contract EPA-68-02-3583)
(PB85-245181; EPA-450/5-85-003A-VOL-1) Avail: NTIS HC A15/MF A01 CSCL 06E

The relationship between ozone and human health benefits was analyzed. The benefits for improved human health associated with possible alternative air quality standards for ozone are identified. GRA

N86-17981# Medical Coll. of Ohio, Toledo. Dept. of Pathology.
BIOASSAY OF MILITARY RELEVANT COMPOUNDS FOR CARCINOGENIC ACTIVITY BY THE STRAIN A MOUSE LUNG TUMOR BIOASSAY Final Phase Report, Mar. 1983 - May 1984
G. D. STONER Jan. 1985 17 p
(Contract DAMD17-81-C-1178; DA PROJ. 3M1-61102-BS-10)
(AD-A156772) Avail: NTIS HC A02/MF A01 CSCL 06E

Two dye compounds, C.I. Solvent Yellow 33 and a mixture of C.I. Solvent Green 3-C.I. Solvent Yellow 33, utilized in colored smoke grenades, were tested for carcinogenic potential in the strain A mouse lung tumor bioassay. The maximum tolerated dose for each dye was determined to be 25 mg/kg. At total doses of 600, 300 and 120 mg/kg, C.I. Solvent Yellow 33 and a mixture of C.I. Solvent Green 3-C.I. Solvent Yellow 33 did not produce an increase in the lung tumor response (i.e., the percentage of mice with lung tumors per mouse) when compared to vehicle (tricaprylin) controls. Therefore, at the dose levels administered both dyes are non-carcinogenic in the strain A mouse lung tumor bioassay under the conditions of the test. At necropsy, mice tested with either compound have significant quantities of accumulated dye in their tissues. This observation suggests that the dyes are either not metabolized or only partially metabolized by the animals.
Author

N86-17982# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
A COMPARISON OF POSTMORTEM CORONARY ATHEROSCLEROSIS FINDINGS IN GENERAL AVIATION PILOT FATALITIES
C. F. BOOZE, JR. and C. M. STAGGS Aug. 1985 12 p
(AD-A159811; DOT/FAA-AM-85-6) Avail: NTIS HC A02/MF A01 CSCL 06E

Autopsy reports of 710 pilots involved in fatal general aviation accidents and received by the FAA for the years 1980 to 1982 were reviewed to appraise the age-specific prevalence of coronary atherosclerosis among the autopsied group and compare findings with those of an earlier study of a similar pilot group. Sixty-nine percent of the autopsies on pilots killed in aircraft accidents indicated some degree of coronary atherosclerosis ranging from minimal to severe. This finding is higher than for a similar group of pilots studied during the years 1975 to 1977. However, only about 2.5% of the 1980 to 1982 study group were found to have severe coronary atherosclerosis, compared with 5% in the previous study. Prevalence of severe coronary atherosclerosis increased with age from 5.8 per 1,000 for ages less than 40 years to 73.9 for ages 50 years and above, also reflecting lower age-specific rates for severe coronary atherosclerosis than were found in the previous study. Recent emphasis on autopsy format and attention to sudden incapacitation is felt to have resulted in more accurate reporting for recent years. Prevalence of severe coronary atherosclerosis among the recently studied pilot group was less than that observed in an earlier study of a similar group. GRA

N86-17983# Harvard Univ., Boston, Mass. School of Public Health.
EXPEDIENT METHODS OF RESPIRATORY PROTECTION. 3: SUBMICRON PARTICLE TESTS AND SUMMARY OF QUALITY FACTORS
J. M. PRICE, D. W. COOPER, and C. S. YEE Jul. 1985 86 p refs
(TI85-018278; NUREG/CR-3537; NRC-A-1042; SAND-83-7450) Avail: NTIS HC A05/MF A01

The efficacy of readily available materials, such as cotton fabrics, toweling, a surgical mask, and a single-use respirator, for providing emergency respiratory protection was evaluated by determining the filtration efficiency as a function of aerosol particle size over the size range of 0.001 to 5.0 micron and as a function of filtration face velocity. Filtration face velocity was set at 1.5, 5.0, and 15.0 sq cm. The equipment and procedures used to obtain efficiency measurements for particles 0.5 micron in diameter and smaller are described. Particles with diameters from 0.10 to 0.50 micron proved to be the most difficult sizes of particles to remove. Particles smaller than 0.10 micron were removed due to diffusion while particles larger than 0.50 micron were removed due to inertia and gravitational settling. Deposition of the smallest particles was favored by the use of low face velocities. A fractional efficiency curve was determined for each material at each velocity for comparison. Values of the quality factor were calculated. Quality factors were less for wet materials than for dry; less at high velocities rather than low; and best for the single-use respirator mask, next best for the surgical mask and often third best for the toweling. E.A.K.

N86-17984# Harvard School of Public Health, Boston, Mass.
ASSESSMENT OF INDIVIDUAL HUMAN EXPOSURES TO OZONE IN A HEALTH STUDY
D. T. MAGE, M. RAIZENNE, and J. SPENGLER Aug. 1985 17 p refs
(PB85-245975; EPA-600/D-85-195) Avail: NTIS HC A02/MF A01 CSCL 06T

The minute dose of ozone delivered to the lower respiratory tract of a subject depends upon the ozone concentration inhaled, the minute volume (Ve 1/min) and the fraction of the inhaled ozone that penetrates the nasopharyngeal passages to enter the trachea. The ozone concentration (X) depends on the time of day and whether the subject is indoors or outdoors. The minute volume depends on the subject's age, sex, weight, and physical activity level. The fractional deposition of ozone depends on the concentration inhaled (X), the minute volume (Ve), and the mode of breathing (nasal or oronasal). These dependencies are reviewed and a calculation of a daily ozone dosage is presented for a prototypical 12-year old child at summer camp who varies his physical activities in indoor and outdoor settings over a 24-hour period. Author (GRA)

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-20408
THE EFFECT OF SKILL ON PERFORMANCE UNDER AN ENVIRONMENTAL STRESSOR
P. A. HANCOCK (Southern California, University, Los Angeles, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 59-64. refs

The paper examines the effect of individual skill level upon task performance in transient extreme heat. A summary of published data suggests that individuals who are skillful at the task are better able to withstand the detrimental effect of the stress exposure than their unskilled counterparts. Three theoretical explanations of such performance superiority are reviewed: behavioral arousal; attentional capacity; and automatic and controlled processing. It is concluded that the automatic and controlled information processing approach holds the greatest potential to account for this effect at the present time. It is suggested that the ability of skilled subjects who are able to resist the effect of heat stress may be a more general attribute of personnel who operter under a variety of nonoptimal environmental conditions. Author

A86-20409
NAVAL TRAINING COMMAND MISHAPS AND INSTRUCTOR EXPERIENCE
M. S. BOROWSKY (U.S. Navy, Naval Safety Center, Norfolk, VA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Jan. 1986, p. 65-70.

Naval Training Command mishaps involving instructor error for a 7-yr period were analyzed to determine the specific underlying causes and the relationships with previous instructor experience. The data show that mishap potential is correlated with previous fleet operational and training flight experience. Moreover, certain types of errors tend to manifeast themselves at specific experience levels. Author

A86-20899
INVARIANT TUNING OF MOTION AFTEREFFECT
M. J. WRIGHT and A. JOHNSTON (Brunel University, Uxbridge, England) Vision Research (ISSN 0042-6989), vol. 25, no. 12, 1985, p. 1947-1955. Research supported by the Medical Research Council of England. refs

Motion aftereffects (MAE) to drifting gratings were measured with a cancellation technique. For a constant adapting grating, MAE cancellation velocity increased linearly with visual field eccentricity. The slope of the function was dependent upon adapting temporal frequency. MAE velocity was independent of spatial frequency (2-16 c/deg) and approximately constant when expressed as an M-scaled velocity. The MAE was broadly tuned to temporal frequency and temporal tuning was independent of spatial frequency and eccentricity. Reducing contrast over the range 1.0-0.1 reduced the magnitude of the MAE at high temporal frequencies, but had no influence at low and moderate temporal frequencies. The results support a ratio model of velocity coding whose spatial reference varies with eccentricity in approximate accordance with the human cortical magnification factor. Author

A86-20900
VELOCITY CODING - EVIDENCE FROM PERCEIVED VELOCITY SHIFTS
A. T. SMITH (University College, Cardiff, Wales) Vision Research (ISSN 0042-6989), vol. 25, no. 12, 1985, p. 1969-1976. Sponsorship: Medical Research Council of England. refs
(Contract UKMRC-G821/3197N)

Measurements of the perceived velocities of moving patterns were made under a variety of conditions in an attempt to gain information concerning the way in which velocity is encoded in the visual system. Adaptation to a pattern moving in the same or opposite direction reduces the perceived velocity of a moving test pattern, but only if the adaptation pattern moves as fast as or faster than the test pattern. The aftereffect peaks at an adaptation velocity slightly higher than the test velocity and then remains constant at higher velocities. Similar results were obtained for several types of pattern. Perceived velocity reduction also follows adaptation to a flickering homogeneous field. The results can be explained in terms of a theory of velocity coding in which two channels are considered in terms of variations in the velocity sensitivities of the neurones they comprise. Author

A86-20972
TASK PARAMETERS AFFECTING INDIVIDUAL DIFFERENCES IN PURSUIT AND COMPENSATORY TRACKING PERFORMANCE
D. BARTRAM, N. BANERJI, D. ROTHWELL, and P. SMITH (Hull, University, England) Ergonomics (ISSN 0014-0139), vol. 28, Dec. 1985, p. 1633-1652. Research supported by the Army Personnel Research Establishment. refs

Two tracking tasks, the control-velocity tester and the sensor motor apparatus (both of which are currently used as aptitude tests for the selection of candidates for pilot training), provide relatively independent measures of performance. As part of the program of research related to the production of the Micropat automated testing system, a number of studies were carried out to identify, the parameters accounting for the functional dissimilarity of these two tasks. While varying control law mixture had a relatively small effect on task intercorrelations, both variation in display mode and number of dimensions substantially reduced them. The effects of limb assignment were complex, though in general they showed that for two-dimensional tasks the important factor was whether control was carried out using a single limb rather than using separate limbs for each dimension. Author

N86-16884# Joint Publications Research Service, Arlington, Va.
PEPTIDES AND MEMORY
L. IVCHENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-85-025) p 31-34 10 Dec. 1985 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 1 Aug. 1985 p 8
Avail: NTIS HC A05/MF A01

The function of the peptides on the mechanism of memory was investigated. It was shown that the hormones of the hypophysis - corticotropin and vasopressin, could be memory stimulants. It is found that peptide substances have a great influence on the central nervous system. The production of synthetic vasopressin is recorded. E.A.K.

N86-16897# Air Force Academy, Colo.
PROCEEDINGS OF THE AIR FORCE CONFERENCE ON TECHNOLOGY IN TRAINING AND EDUCATION (TITE)
Apr. 1985 596 p Conference held in Colorado Springs, Colo., 15-19 April 1985
(AD-A157829) Avail: NTIS HC A25/MF A01 CSCL 05I

Although the field of Artificial Intelligence has the potent enhance the Air Force's readiness and ability to respond to situations, too few people really known what it is, or what the Air Force. In addition, most educational programs in AI towards the PhD student and are very theoretical. At the Air Institute of Technology, we have developed an engineering in AI at the masters of science level. This program is one masters degree programs available. In addition this represent first programs to extract the engineering techniques from Artificial Intelligence. In this report, the above program described along with our philosophy and approach to teaching. GRA

N86-16898# Illinois Univ., Urbana. Computer-based Education Research Lab.
APPLICATION OF COMPONENT SCORING TO A COMPLICATED COGNITIVE DOMAIN
K. K. TATSUOKA and K. YAMAMOTO 15 May 1985 29 p
(Contract N00014-82-K-0604)
(AD-A157897; AD-E900470; CERL-85-2-ONR) Avail: NTIS HC A03/MF A01 CSCL 05J

The recent development of cognitive psychology and science suggests that the lack of understanding of important structural relations between the entities in a problem-solving domain causes difficulties in learning. This study proposes a new scoring method by which the structural relations as well a processes used in subcomponents of the knowledge structure are taken into account when determining the scores. By so doing, a score of I derived by wrong reasons will be eliminated and patterns of zeros and ones will contain information closely associated with student's cognitive processes. The procedure is illustrated with basic electricity problems. GRA

N86-16899# Illinois Univ., Urbana. Computer-based Education Research Lab.
BUG DISTRIBUTION AND PATTERN CLASSIFICATION
K. K. TATSUOKA and M. M. TATSUOKA 15 Jul. 1985 34 p
(Contract N00014-82-K-0604)
(AD-A157898; AD-E900470; CERL-85-3-ONR) Avail: NTIS HC A03/MF A01 CSCL 12A

A model (called rule space) which permits measuring cognitive skill acquisition, diagnosing cognitive errors, detecting the weaknesses and strengths of knowledge possessed by individuals was introduced earlier. This study further discusses the theoretical foundation of the model by introducing Bug Distribution and hypothesis testing (Bayes' decision rules for minimum errors) for classifying and individual into his/her most plausible latent state of knowledge. The model is illustrated with the domain of fraction arithmetic and compared with the results obtained from a conventional Artificial Intelligence approach. GRA

N86-16900# Defence Research Information Centre, Orpington (England).
VARIATIONS IN STATE OF VIGILANCE DURING CONTINUOUS OPERATIONS AT A COMMAND POST
J. FOURCADE, A. BUGUET, R. BUGAT, and C. RAPHEL Jul. 1985 36 p refs Transl. into ENGLISH from AGARD Conference Proceedings 16 p Proceedings of Conference No. 338, Sustained Intensive Air Operations: Physiological and Performance Aspects
(DRIC-T-7503; BR96591) Avail: NTIS HC A03/MF A01

The changes in mental and decision making abilities in personnel working at division command posts, during four maneuvers which took place continuously over several days were studied to appraise the problems which arise during continuous operations, and to give advice to commanders on the organization of the waking - sleeping rhythm at command posts and on arrangements which can be encouraged in order to facilitate the work and reduce mental load factors. Physiological, biochemical, and psychological implications of continuous operations are discussed. Author (ESA)

N86-17985# Bundesanstalt fuer Flugsicherung, Frankfurt am Main (West Germany). Buero der Nachrichten fuer Luftfahrer.
INSTRUCTIONS FOR FLIGHT CREW MEMBERS AND FLIGHT CREW TRAINING AND EXAMINATION GUIDELINES OF THE WEST GERMAN FEDERAL BOARD OF TRANSPORT [VERORDNUNG UEBER LUFTFAHRTPERSONAL (LUFTPERSV) UND RICHTLINIEN DES BUNDESMINISTERS FUER VERKEHR FUER DIE AUSBILDUNG UND PRUEFUNG DES LUFTFAHRTPERSONALS]
Apr. 1984 124 p In GERMAN
(REPT-1) Avail: NTIS HC A06/MF A01

Regulations for obtaining flight authorization and for flight legitimacy for private aircraft pilots, for air navigators, and airline crew members, as well as certifications for onboard instruments and long distance flights were determined. The guidelines of the West German Federal Board of Transport for crew members' theoretical and practical training, and examinations in mathematics, physics, chemistry, and English were drawn up. Examples of the tests are given. Author (ESA)

N86-17986# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Vision Research Group.
PHOTOSIMULATION OF TARGET ACQUISITION IN THE PRESENCE OF SMOKE: A PILOT STUDY
J. M. VALETON and J. J. VOS Nov. 1984 19 p refs
(Contract A79/KL/151)
(IZF-1984-36; TDCK-79980) Avail: NTIS HC A02/MF A01

A quality measure derived from smoke screen hole statistics was related to the probability of target detection. A background scene (hilly landscape), a target (tank silhouette in 1 of 20 possible locations) and a smoke screen (strong homogeneous veil of light) were projected onto a screen. Observers searched the scene with

a rotatable telescope (magnification x 1) and fired when a target was found. The smoke projector was switched on and off to produce sequences of holes and obscurations corresponding to a prescribed smoke screen quality. Results show that smoke quality is a good predictor of target screening; targets are found only when the sight passes over them; even relatively conspicuous targets do not attract enough attention to disrupt the regular search pattern; and search speed is strongly determined by target conspicuousness. Author (ESA)

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-19302
COMPUTER TOOLS AND TECHNIQUES FOR ANALYSIS OF DISCRETE DATA FROM AIRCREW AUTOMATED ESCAPE SYSTEMS (AAES)
J. D. FRITSVOLD and J. E. VETTER (U.S. Navy, Analytical Systems Div., Washington, DC) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 37-40. refs

Analyses have been conducted for automated aircrew escape systems, using statistical models generated in part by computer tools to study the significant factors that contribute to problems during ejections or emergency escapes. Extensive use is made in this work of discrete variables that are presented in a frequency table of cross classifications. Significant associations are thereby established, while spurious ones are rejected. The computational capability in question allows the study of the effects of several factors simultaneously on a variable of interest, such as the likelihood of a severe injury or fatality during an aviation emergency. O.C.

A86-19304* ILC Industries, Inc., Frederica, Del.
DEVELOPMENT OF A ZERO-PREBREATHE SPACESUIT
J. F. RAYFIELD (ILC Industries, Inc., Frederica, DE), J. J. KOSMO (NASA, Johnson Space Center, Houston, TX), and C. W. FLUGEL (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 46-50.

This paper presents the results of a program to develop an improved high pressure (zero-pre-breathe) spacesuit utilizing the latest joint technology as well as materials and processes which are consistent with the space environment and suit production techniques. Other development objectives include: longer life, lower joint torques with increased ranges, improved reproducibility and reliability, facilitated resizing ability and increased overall performance capability when compared to the present Shuttle Orbiter Spacesuit at the higher pressures. Author

A86-19309
U.S. NAVY ALSS CORPORATE REPORT 1984
E. P. VOLLMER (US. Naval Air Systems Command, Washington, DC) and D. N. DESIMONE (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 71-74.

This paper provides an overview of the Navy's Aviation Life Support Systems (ALSS) programs that have entered or completed engineering development. The various development programs show a continued emphasis on escape systems and anti-exposure clothing and equipment and a relatively new development focal point, CBR defense. Additional subject areas addressed include oxygen systems, restraint systems, parachutes and flotation equipment. The current status for each program is detailed, along with planned near-term efforts and, where available, projected contractual efforts. Author

A86-19310
HOW MUCH INHERENT BUOYANCY IS ACCEPTABLE IN A HELICOPTER PASSENGER IMMERSION SUIT
C. J. BROOKS and J. D. M. PROVENCHER IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 75, 76. refs

The buoyancy value of helicopter crewmembers' immersion suits (for hypothermia protection) may be so high as to actually prevent escape from an immersed helicopter's inverted cabin. A recent evaluation of quick-down immersion suits noted a wide range of inherent buoyancies. Attention is presently given to the tradeoffs between inherent buoyancy, hypothermia protection, and underwater escape capability. A 20-lb inherent buoyancy figure is recommended. O.C.

A86-19315
MOLECULAR SIEVE OXYGEN SYSTEMS AND AIRCRAFT ROLE
R. CASSIDY and A. H. BAKER (Normalair-Garrett, Ltd., Yeovil, England) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 99-102.

Aircraft type will extert an influence on the size and configuration of future molecular sieve, pressure swing absorption-operation On-Board Oxygen Generation Systems (OBOGS). Attention is given to the design requirements most likely generated by OBOGS application to such aircraft types as single seat fighters, multiperson crew fixed wing aircraft, trainers, and helicopters. OBOGSs can furnish oxygen over essentially unlimited mission durations. O.C.

A86-19329
LIMB RESTRAINT EVALUATOR (LRE)
T. GUSTIN (Systems Research Laboratories, Inc., Dayton, OH) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 183-187. USAF-supported research.

The present paper provides a description of a state-of-art data acquisition and recording system which is part of an advanced ejection system test manikin developed by an American company. The manikin is the Limb Restraint Evaluator (LRE), which was designed to test restraint devices to be incorporated into modern aircraft ejection equipment by the U.S. Air Force. The design goals of the LRE are considered, taking into account the successful sensing and capturing of data for 96 phenomena sources for a free-flight test article for the ACES II restraint tests. Difficulties related to the extremely large number of data channels were overcome by employing a Pulse Code Modulation (PCM) type system (time multiplexed). Attention is also given to the use of a low pass filter, a challenge related to telemetry dropout, the selection of onboard storage technique, and the CPU. G.R.

A86-19330
HUMAN ERROR IN LIFE SUPPORT OPERATIONS
W. L. EPPERSON and J. GAVERN (USAF, Wright-Patterson AFB, OH) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 188-191. refs

An assessment is made of the impact of human factors on the activities of the four main groups involved in the operations of life support systems: designers, system maintainers, life support instructors and trainers, and aircrew members. Aside from the factors influencing all individuals' general behavior, such as personal, psychological, and physical problems, there are specific personal characteristics crucial for the success of life support systems at each of the four stages of execution. Thus, the designer must have a thorough understanding of the relationship of the equipment to the aircraft and the crewmember. For example, in the design of a parachute harness, it is important to consider the

stature of individuals. Boredom and fatigue, together with tight flying schedules, are the main contributors to maintenance failures, while poorly written or incomplete instructions may lead to faulty execution. Finally, crewmembers' overconfidence often leads to neglect of safety precautions in favor of comfort during flight.
I.S.

A86-19333
THE EFFECT OF WATER INGRESS ON BUOYANCY AND THERMAL QUALITY OF SURVIVAL SUITS
A. PASCHE (Norwegian Underwater Technology Centre, Laksevas, Norway) and R. ILMARINEN (Institute of Occupational Health, Helsinki, Finland) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 204-207. Research supported by Statoil. refs

Several survival suits have been tested regarding water leakage in the suit during evacuation from a sinking and turned helicopter, total buoyancy for a person dressed in a suit, and the suits insulating properties after evacuation from the helicopter. Water content in the suit followed an evacuation with partly open zippers would be in order of 9-18 kg. Closed-off air in the suit could give some suits a buoyancy in a turned helicopter as high as 40-50 kg. Water leakage into the suits, which is likely to occur, would change the thermal insulation properties of the suits. Even smaller water ingress would have considerably effect on body cooling, while water ingress in a magnitude as established for the evacuation situation result in a very rapid drop in core temperature of the subject (2.0-2.5 C/hour). Author

A86-19336
PROTECTIVE RESPIRATOR FOR THE AAH-64 ADVANCED ATTACK HELICOPTER
D. M. ENGLISH (U.S. Army, Chemical Research and Development Center, Aberdeen Proving Ground, MD) and L. DICKERSON (ILC Industries, Inc., Frederica, DE) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 223-226. Army-supported research.

The present paper is concerned with the background and development philosophy utilized in designing and fabricating a protecting mask system for the U.S. Army AH-64 Attack Helicopter. The very sophisticated weapons and flight systems employed by this helicopter require close optical coupling to various devices. For this reason, current protective masks cannot be used effectively. The U.S. Army issued, therefore, a contract for the development of a protective mask which would interface with the AH-64 Integrated Helmet and Display Sighting System (IHADSS). Attention is given to a description of the AH-64 helicopter, the operational capabilities of the AH-64, mask system requirements, a mask system description, a blower system description, and a program overview. An accelerated development of the IHADSS mask system will allow the U.S. Army to field the AH-64 helicopter on schedule. G.R.

A86-19338
COULD ANTHROPOMETRIC DUMMY DATA BE USED TO PREDICT INJURY TO HUMANS?
C. D. GRAGG (USAF, Holloman AFB, NM) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 233-236.

Anthropometric dummy and ejection seat data from two recent sled test programs were analyzed. The objective of the analysis was to determine the value of anthropometric dummy data for predicting the probability of spinal and/or disabling injury. One program used a seat which has been in the inventory for many years; the other used a modern, high performance seat. The two programs consisted of a total of 16 tests. All tests were conducted on the High Speed Test Track at Holloman Air Force Base, New Mexico. The results showed some promise for use of the Dynamic Response Index (DRI). They showed little promise for the use of Gx and Gy acceleration data. Author

A86-19341
DEVELOPMENT OF AN IMPROVED LIQUID COOLING SYSTEM
R. ALGERA (ILC Industries, Inc., Frederica, DE) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 251-254.

Design changes required in liquid cooling systems to improve the efficiency of the system are discussed. The cooling system designed consists of: (1) a jacket outerlayer fabricated from looseweave nylon stretch fabric with a network of soft, flexible tubing woven in, (2) an inner layer of lightweight nylon tricot, (3) a heat exchanger assembly, and (4) a backpack. The entire ensemble weighs 12.15 lb dry and 24.05 with the coolant fluid and ice. The components and function of the heat exchanger assembly are described. The use of a slush machine to resupply ice to the heat exchanger assembly is studied. The applicability of the cooling system is tested. Three experiments are performed: one with just the CB ensemble, the second with the CB ensemble and a liquid cooling system of one hour duration at a heat removal rate of 1200 BTU/hr, and the third with the CB ensemble and a cooling system of a half-hour duration at 1200 BTU/hr. It is concluded that the cooling system is a practical solution to the heat stress problems of ground support personnel; however, the weight of the system needs to be reduced for the system to function at maximum efficiency. I.F.

A86-19342
CANADIAN DEVELOPMENTS IN AIRCREW CHEMICAL DEFENCE PROTECTION
G. K. STEWART and J. J. MONTOUR (Aerospace Engineering Test Establishment, Medley, Canada) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 255-258. refs

A86-19343
PILOT UNDERWATER HIGH PRESSURE EMERGENCY BREATHING SYSTEM
M. RATAJCZAK (Moog, Inc., East Aurora, NY) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 259-262.

The High Pressure Emergency Breathing System (HPEBS) has the objective to provide life support for an aircrewman in the event of a parachute landing over water. A water activated switch closes the antisuffocation valve in the breathing system, and the HPEBS is actuated. A utilization of the HPEBS increases survival possibilities for an aircrewman in a high sea state. The HPEBS is to provide 500 standard liters of air for consumption. The air is stored in a high pressure spherical vessel. A pyrotechnic actuator and a pressure reducer is also provided. Attention is given to details of pressure vessel design, the pyrotechnic squib, aspects of pressure reducer design, and acceptance level test results.
G.R.

A86-19344
LABORATORY AND FLIGHT TESTING OF BALLISTIC PROTECTIVE HEADGEAR FOR ROTARY WING AIRCREW
D. S. MCCAULEY (U.S. Naval Material Command, Naval Air Development Center, Warminster, PA) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 263-268. refs

The results of laboratory and flight tests on two types of ballistic protective gear developed for helicopter aircrew that can be exposed to small arms fire and fragments are reported. The type 1 system is a complete ballistic protective helmet assembly, while the type 2 system consists of a ballistic clip-on unit which can be quickly added to a lightweight, form-fitting helmet. Both systems were shown to meet the ballistic requirements, when tested in accordance with standard requirements of an average ballistic limit, V50, of 1150 ft/s for a 17 grain, 0.22 caliber, type 2 fragment-simulating projectile, and demonstrated good impact

resistance. Although most subjects in the flight tests preferred the clip-on system because of weight considerations, the ANVIS ready helmets available to almost all battlefield aircrew are not compatible with a ballistic clip-on bonnet. Therefore, further development of the type 1 system only is recommended. I.S.

A86-19345
THE STATE OF THE ART OF ANTHROPOMORPHIC MANIKINS AND REQUIREMENTS FOR THE EVALUATION OF ADVANCED AIRCRAFT EJECTION SYSTEMS
J. A. TIEBER (Systems Research Laboratories, Inc., Dayton, OH) IN: SAFE Association, Annual Symposium, 22nd, Las Vegas, NV, December 9-13, 1984, Proceedings . Van Nuys, CA, SAFE Association, 1985, p. 269-275.

A study was conducted to define the capabilities of existing anthropomorphic manikins and the capabilities required of modern manikins to be suitable for the evalution of advanced aircraft escape systems. Specifications for an advanced ejection system test manikin, which resemble and act like a human body when subjected to aerodynamic and inertial loadings associated with aircraft escape conditions, include the simulation of human response to force loadings at various body components, anthropometric accuracy, mass and inertial properties of various body segments, joint articulation, and structural strength. Data acquisition considerations include the type and placement of sensors, number of data channels, data processing and formatting, and on-board storage and/or telemetry requirements. The standard packaging, placement, and environmental protection factors also must be considered. The development of a family of manikins, consisting of an average member and two members representing the fifth and 95th percentiles of the anthropometric spectrum, is recommended. I.S.

A86-19811*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN EXPERT SYSTEMS APPROACH TO AUTOMATED FAULT MANAGEMENT IN A REGENERATIVE LIFE SUPPORT SUBSYSTEM
J. T. MALIN and N. LANCE, JR. (NASA, Johnson Space Center, Houston, TX) AIAA, Aerospace Sciences Meeting, 24th, Reno, NV, Jan. 6-9, 1986. 9 p. refs
(AIAA PAPER 86-0321)

This paper describes FIXER, a prototype expert system for automated fault management in a regenerative life support subsystem typical of Space Station applications. The development project provided an evaluation of the use of expert systems technology to enhance controller functions in space subsystems. The software development approach permitted evaluation of the effectiveness of direct involvement of the expert in design and development. The approach also permitted intensive observation of the knowledge and methods of the expert. This paper describes the development of the prototype expert system and presents results of the evaluation. Author

A86-20110
UNDERLYING BEHAVIORAL PARAMETERS OF THE OPERATION OF TOUGH-INPUT DEVICES - BIASES, MODELS, AND FEEDBACK
D. B. BERINGER and J. G. PETERSON (Wisconsin, University, Madison) Human Factors (ISSN 0018-7208), vol. 27, Aug. 1985, p. 445-458. refs

Touch-entry devices have exhibited a number of advantages in relatively low-resolution applications. Requirements for high-resolution input must, however, take into account the inherent biases and limitations of the operator. In this study performance biases in the use of an infrared touch-input device were examined with the input (display) surface at various declinations. A general bias to touch low and to the right of targets was found, the low bias increasing with increasing display declination. Attempts to reduce bias error through simple models based upon earlier trials were more effective when derived from individual performances rather than populational behavior (averages). Handedness effects on performance were also found. Training is discussed as a viable alternative, along with preliminary training results. Author

A86-20507
ROBOTICS AND THE SPACE STATION
J. N. GOWDY (Clemson University, SC) and R. S. WALLACE (Carnegie-Mellon University, Pittsburgh, PA) IN: SOUTHEASTCON '84; Proceedings of the Conference, Louisville, KY, April 8-11, 1984 . New York, Institute of Electrical and Electronics Engineers, 1984, p. 173-176.

This paper is based on the authors' activities associated with the NASA/ASEE summer study 'Autonomy and the Human Element in Space' at Stanford University in 1983. The paper considers proposed tasks for robots in connection with space station activities. Generic capabilities needed to execute these tasks are also discussed. It is argued that NASA should sponsor robotics research which is directly connected with space activities. Author

A86-21068* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ORBITAL FLIGHT TEST OF THE MANNED MANEUVERING UNIT
R. L. STEWART (NASA, Johnson Space Center, Houston, TX) IN: Society of Experimental Test Pilots, Symposium, 28th, Beverly Hills, CA, September 26-28, 1984, Proceedings . Lancaster, CA, Society of Experimental Test Pilots, 1984, p. 282-312.

Based on the experience provided by the first astronaut maneuvering unit used in the early extravehicular activities missions, a manned maneuvering unit (MMU) was developed that culminated in emergence of the M509 unit. The M509 unit, flown on the STS41-B, is a self-contained propulsive backpack. A flight support station (FSS) provides cargo bay stowage for the MMU, serves as a donning/doffing station, and provides an interface with the Orbiter gaseous nitrogen system for propellant refueling, electrical power for heaters, and temperature instrumentation. The MMU propulsion system, its control system, the electrical system and the flight displays are described. The orbital flight test has demonstrated superior handling and flying qualities of the MMU. I.S.

A86-22325* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS FOR SPACE HABITATS
P. BUCHANAN (NASA, Kennedy Space Center, Cocoa Beach, FL) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 21, Dec. 1984, p. 70-74.

The development of regenerative life support systems to meet the physiological requirements of humans in space is described. A review of previous research on regenerative systems is presented. NASA's Controlled Ecological Life Support System (CELSS) program, which is to develop an environment for a human space crew, is discussed. The table of physiological requirements of an average human and the logical system approach to planning a closed system created by Spurlock and Modell (1976, 1978) are examined. The weight of food and oxygen with respect to lift-off weight is investigated. The creation of the proper atmosphere for space, by balancing all the necessary parameters is studied. The need for a mineral and fluid balance and methods of maintaining it are analyzed. The required cooperation between physicians, physiologists, and nutritionists for the success of the CELSS program is discussed. I.F.

A86-22626
A NEW APPLICATION OF ADAPTIVE NOISE CANCELLATION
W. A. HARRISON (Sanders Associates, Inc., Nashua, NH), J. S. LIM (MIT, Cambridge, MA), and E. SINGER (MIT, Lexington, MA) IEEE Transactions on Acoustics, Spech, and Signal Processing (ISSN 0096-3518), vol. ASSP-34, Feb. 1986, p. 21-27. Research sponsored by Sanders Associates, Inc. refs
(Contract NR PROJECT 049-506; N00014-81-K-0742; F19628-85-K-0028; NSF ECS-80-07102)

Widrow et al's (1975) adaptive noise cancellation (ANC) method is applied to the case where an acoustic barrier exists between the primary and reference microphones. ANC, by updating the coefficients of the noise estimation filter only during silence, can furnish substantial noise reduction with little speech distortion even when the acoustic barrier provides only moderate attenuation of acoustic signals. An evaluation is made of a modification of ANC for the oxygen facemasks worn by fighter pilots; if a noise field is created using a single source, an 11-dB SNR improvement is achieved by attaching a reference microphone to mask's exterior. O.C.

N86-16901*# Massachusetts Inst. of Tech., Cambridge. Man Machine Systems Lab.
EFFECT OF TIME SPAN AND TASK LOAD ON PILOT MENTAL WORKLOAD
S. L. BERG and T. B. SHERIDAN Jan. 1986 152 p refs
(Contract NAG2-227)
(NASA-CR-177388; NAS 1.26:177388) Avail: NTIS HC A08/MF A01 CSCL 05H

Two sets of simulations designed to examine how a pilot's mental workload is affected by continuous manual-control activity versus discrete mental tasks that included the length of time between receiving an assignment and executing it are described. The first experiment evaluated two types of measures: objective performance indicators and subjective ratings. Subjective ratings for the two missions were different, but the objective performance measures were similar. In the second experiments, workload levels were increased and a second performance measure was taken. Mental workload had no influence on either performance-based workload measure. Subjective ratings discriminated among the scenarios and correlated with performance measures for high-workload flights. The number of mental tasks performed did not influence error rates, although high manual workloads did increase errors. E.A.K.

N86-16902*# GARD, Inc., Niles, Ill.
CATALYTIC DISTILLATION WATER RECOVERY SUBSYSTEM
P. BUDININKAS and F. RASOULI Sep. 1985 104 p
(Contract NAS2-11687)
(NASA-CR-177382; NAS 1.26:177382) Avail: NTIS HC A06/MF A01 CSCL 06K

An integrated engineering breadboard subsystem for the recovery of potable water from untreated urine based on the vapor phase catalytic ammonia removal was designed, fabricated and tested. Unlike other evaporative methods, this process catalytically oxidizes ammonia and volatile hydrocarbons vaporizing with water to innocuous products; therefore, no pretreatment of urine is required. Since the subsystem is fabricated from commercially available components, its volume, weight and power requirements are not optimized; however, it is suitable for zero-g operation. The testing program consists of parametric tests, one month of daily tests and a continuous test of 168 hours duration. The recovered water is clear, odorless, low in ammonia and organic carbon, and requires only an adjustment of its pH to meet potable water standards. The obtained data indicate that the vapor phase catalytic ammonia removal process, if further developed, would also be competitive with other water recovery systems in weight, volume and power requirements. Author

N86-16903*# Economics Lab., Inc., St. Paul, Minn.
A STUDY TO DEFINE A SET OF REQUIREMENTS FOR CLEANSING AGENTS FOR USE IN THE SPACE STATION WHOLE BODY SHOWER Final Report
29 Oct. 1985 95 p
(Contract NAS9-17428)
(NASA-CR-171910; NAS 1.26:171910) Avail: NTIS HC A05/MF A01 CSCL 06K

The objective of this research is to define a set of requirements for a whole body cleansing agent to be used in the Space Station Whole Body Shower System. In addition, cleansing agent candidates are to be identified that are likely to satisfy requirements defined in the first part of the study. It is understood that the main reason for having a Whole Body Shower is to satisfy the physiological, psychological and social needs of the crew throughout the duration of duty in the Space Station. The cleansing agent must also be compatible with the vortex water/gas separator and the water reclamation system. To accomplish these goals the study was divided into six tasks. Author

N86-16904# Naval Postgraduate School, Monterey, Calif.
OPERATIONS RESEARCH TECHNIQUES FOR HUMAN FACTORS ENGINEERS M.S. Thesis
J. H. LIND Jun. 1985 193 p
(AD-A159384) Avail: NTIS HC A09/MF A01 CSCL 05H

In this thesis a variety of operations research techniques and models that are applicable to human factors engineering problems are identified and classified according to the functions or purposes for which they are useful. Several of these techniques are described in sufficient detail for a human factors engineer to determine if they are applicable to a problem of interest. Uses for techniques are illustrated in military-related human factors settings, primarily related to the Navy's antiair warfare mission. References are provided for additional information on each technique. Author (GRA)

N86-16905# Research Inst. of National Defence, Stockholm (Swedan). Dept. 5.
OPERATOR ENVIRONMENT IN THE NINETIES
H. MARMOLIN and S. LOEF Apr. 1985 25 p refs In SWEDISH; ENGLISH summary
(FOA-A-50002-H2; ISSN-0281-0239) Avail: NTIS HC A02/MF A01

A program of research and development in man-information systems is outlined. Human factors engineering, display, dialog, and design of decision aid systems from a man-machine approach are discussed. A program to ensure knowledge transfer and an effective dialog with possible users was created. Author (ESA)

N86-17987 Admiralty Marine Technology Establishment, Portsmouth (England). Experimental Diving Unit.
PERFORMANCE COMPARISON OF THIRTY, TWO-STAGE DEMAND REGULATORS
I. A. HIMMENS Jan. 1984 25 p refs
(ARE(M6)-TM-83818; BR94139) Avail: NTIS HC A02/MF A01

Thirty, two-stage air demand regulators were tested. Only 2 meet the recommended limits for breathing resistance and work of breathing for the 3 ventilation rates at the maximum depth of 50 msw. A majority of the regulators exhibit rapid degradation of inhalation response at a ventilation rate of 62.5 l/min, beyond their respective maximum depths or as cylinder pressures approach 30 Bar. Author (ESA)

N86-17988 Royal Air Force Inst. of Pathology and Tropical Medicine, Aylesbury (England). Aircraft Equipment Group.
A WATERPROOF VENT VALVE FOR IMMERSION SUITS
G. RICHARDSON Dec. 1984 20 p refs
(REPT-515; BR95132) Avail: NTIS HC A02/MF A01

An air vent valve for flight crew immersion suits was developed. Experiments show that the valve, closed by hydrostatic pressure, vents an immersion coverall undergoing rapid changes in altitude. Such a valve allows no water to enter the coverall during immersion in water with moderate wave motion or doing normal dinghy entry

drills. Exploitation of the technique significantly improves comfort to users of air immersion coveralls at altitude. It prevents loss of insulation through collapse on descent. The advantages can be maintained without the risk of allowing water to enter the coverall. Extension of the principle to allow microclimatic ventilation by bellows action is suggested. Author (ESA)

N86-17989# Oak Ridge National Lab., Tenn.
ADVANCED SERVOMANIPULATOR DEVELOPMENT
D. P. KUBAN 1985 41 p Presented at the France/US Department of Energy Meeting on Remote Systems Technology, Saclay, France, 2 Sep. 1985
(Contract DE-AC05-84OR-21400)
(DE85-017720; CONF-8509156-2) Avail: NTIS HC A03/MF A01

The Advanced Servomanipulator (ASM) System consists of three major components: the ASM slave, the dual arm master controller (DAMC) or master, and the control system. The ASM is remotely maintainable force-reflecting servomanipulator developed at the Oak Ridge National Laboratory (ORNL) as part of the Consolidated Fuel Reprocessing Program. This new manipulator addresses requirements of advanced nuclear fuel reprocessing with emphasis on force reflection, remote maintainability, reliability, radiation tolerance, and corrosion resistance. The advanced servomanipulator is uniquely subdivided into remotely replaceable modules which will permit in situ manipulator repair by spare module replacement. Manipulator modularization and increased reliability are accomplished through a force transmission system that uses gears and torque tubes. Digital control algorithms and mechanical precision are used to offset the increased backlash, friction, and inertia resulting from the gear drives. This results in the first remotely maintainable force-reflecting servomanipulator in the world. DOE

N86-17990# Clarke Ambrose, Inc., Knoxville, Tenn.
HUMAN-MACHINE INTERFACES FOR TELEOPERATORS: AN OVERVIEW OF RESEARCH AND DEVELOPMENT AT THE OAK RIDGE NATIONAL LABORATORY. CONSOLIDATED FUEL REPROCESSING PROGRAM
J. V. DRAPER and M. J. FELDMAN 1985 23 p Presented at the France/U.S. Department of Energy Meeting on Remote Systems Technology, Saclay, France, 2 Sep. 1985 Prepared in cooperation with ORNL, Tenn.
(Contract DE-AC05-84OR-21400)
(DE85-017713; CONF-8509156-1) Avail: NTIS HC A02/MF A01

This paper surveys the contributions of human factors to the mission of the Remote Control Engineering (RCE) task over the last 6 years. These contributions can be divided into two areas, research efforts and design efforts. Some of the topics covered in human factors research are manipulator comparisons, investigation of viewing system characteristics, research into the effects of force reflection, and studies of crew size and task allocation. In the area of component design the human factors group was primarily responsible for the conceptual design of the Advanced Integrated Maintenance System (AIMS) control room, including all operator work stations and overall control room architecture. The human factors group also contributed to the design of the AIMS master controller handle. Recent research at the RCE task has centered on comparison of manipulator systems. This research was planned and conducted by the human factors group and other ORNL personnel. The research is aimed at evaluating three important characteristics of manipulator systems: system dynamics, force feedback, and human-machine interface. DOE

N86-17991# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.
THE BIOMORPHIC MODEL OF THE HUMAN PILOT
O. H. GERLACH 1984 134 p refs
(VTH-LR-310) Avail: NTIS HC A07/MF A01

A mathematical model of the overt behavior of a human operator when controling an aircraft-like dynamic element in a closed loop situation is described. Since the aim is to achieve a close correspondence between the physiological and psychological processes going on in the human controller and their mathematical expression in the model, the latter is named the biomorphic model. The model refers only to single-display, single-axis control situations. A computer program selecting the free parameters in the model and calculating their characteristics is discussed. Author (ESA)

N86-17992# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Thermofysiologie.
HEAT TRANSFER IN IMPERMEABLE CLOTHING: SWEAT PLAYS A ROLE AFTER ALL
F. J. G. VANDELINDE, H. VANMIDDENDORP, and W. A. LOTENS May 1985 19 p refs In DUTCH; ENGLISH summary
(Contract A81/K/041)
(IZF-1985-9; TDCK-93219) Avail: NTIS HC A02/MF A01

In a laboratory experiment with six subjects, the effective thermal insulation of a totally impermeable outfit was measured in two different conditions to prove that vapor transfer contributes to the total heat release of the subjects. In the first condition, condensation of evaporated sweat in the inside of the outer impermeable was made impossible, in the second condition such condensation was allowed. Processes of humid heat transfer inside the clothing cause a 40% decrease in effective insulation. Therefore, at ambient temperatures lower than skin temperature, heat stress is lower than expected on the basis of clothing insulation judged by thickness or determined in nonhumid situations. Author (ESA)

N86-17993# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Technische Menskunde.
A COMPUTER AIDED DESIGN (CAD) SYSTEM AS A TOOL FOR THE ERGONOMIST IN DEVELOPING MAN-MACHINE SYSTEMS
P. I. L. MOONEN Jun. 1985 37 p refs In DUTCH; ENGLISH summary
(IZF-1985-10; TDCK-93253) Avail: NTIS HC A03/MF A01

The use of a Computer Aided Design (CAD) system in an anthropometric computer model is discussed. For its presentation function, ease of operation, interpretation, etc. are required. However, for the test function, ergonomic knowledge expressed in standards is demanded. The possibilities and limitations of an existing CAD system are discussed. The profit of the system concerning the test function is doubted, for ergonomic knowledge is rarely expressed in standards. In case of the realization of a test function, a substantial investment is required, justified only by frequent and large-scale use. Author (ESA)

N86-17994# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Afd. Visuologie.
COLOR ON DISPLAYS. PART 1: THE PSYCHOPHYSICAL AND PHYSIOLOGICAL ASPECTS
J. WALRAVEN Jun. 1985 71 p refs In DUTCH; ENGLISH summary
(IZF-1985-11; TDCK-93254) Avail: NTIS HC A04/MF A01

Aspects of color, important for display designers and human factors engineers, who use color for structuring, coding and/or accentuation of display information, are presented. The dimensions of color (perceptual and stimulus); discriminating between the aperture and object mode, color metrics and its applicability for display colors, perceptual artefacts, and the diminished color discrimination for small visual angles (small-field tritanopia), color in relation to accomodation problems (chromatic aberration, resting focus), and the problem of the display user with defective color vision are considered. Author (ESA)

N86-17995# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
PSYCHOLOGICAL PROBLEMS ASSOCIATED WITH THE WEARING OF RESPIRATORY PROTECTIVE DEVICES: A REVIEW
E. MAURITZSON-SANDBERG and L. SANDBERG Jun. 1985 37 p refs In SWEDISH; ENGLISH summary Sponsored by Swedish Civil Defence Administration
(FOA-C-40216-C2; ISSN-0347-2124) Avail: NTIS HC A03/MF A01; Research Institute of National Defence, Stockholm KR 50

Psychological reactions to wearing breathing apparatus were studied. Discomfort is found to be associated with restricted speech transmission, restricted field of view, and increased inhalation and exhalation resistance. A relatively rapid adaptation to the wearing of respirators is noted. Sensory deprivation and motivation are discussed. Author (ESA)

N86-17996# Societe Nationale Industrielle Aerospatiale, Marignane (France). Helicopter Div.
HELICOPTER COCKPIT ORGANIZATION FOR NIGHT VISION
M. A. VEVE 1985 8 p Presented at 11th European Rotorcraft Forum, London, England, 10-13 Sep. 1985
(SNIAS-852-210-103) Avail: NTIS HC A02/MF A01

Ultraviolet lighting associated with a yellow-green fluorescent paint was selected as a cockpit night vision system compatible with the use of light intensification goggles, when performing military missions at night. The characteristics of night vision goggles are reviewed. Ergonomic and safety aspects are discussed. The system proposed optimizes the cockpit lighting with regard to physiological properties of the human eye. The spectral output of the lighting system is separated from the spectral response of the image intensifier photocathode. Author (ESA)

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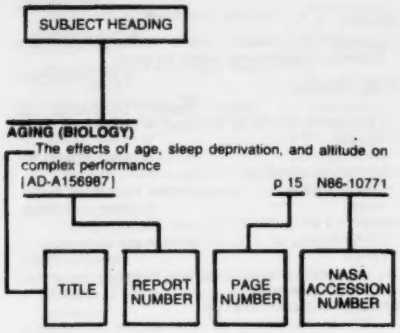
PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-21644
SURVIVAL OF THE JOVIAN PLANETS WITH THE SUN A RED GIANT
S. C. VILA (Pennsylvania, University, Philadelphia) Earth, Moon, and Planets (ISSN 0167-9295), vol. 33, Dec. 1985, p. 219-221.

The survival of the Jovian planets and their satellites as the sun becomes a Red Giant is considered. It is found that the Jovian planets would not lose any matter - not even hydrogen. The satellites would lose their gaseous or volatile envelopes. Their rocky cores would resist melting and survive. Both the planets and the satellites would be unsuited to support human life.
Author

Typical Subject Index Listing



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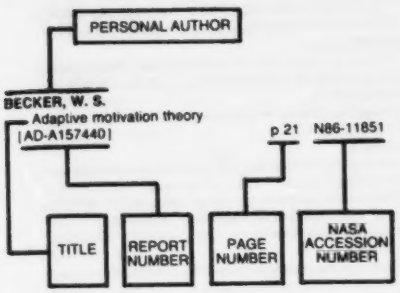

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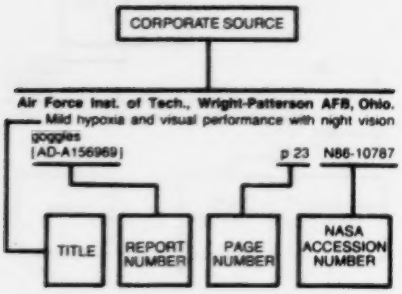

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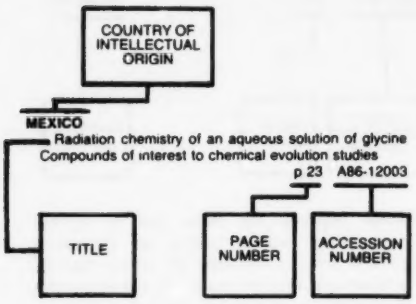

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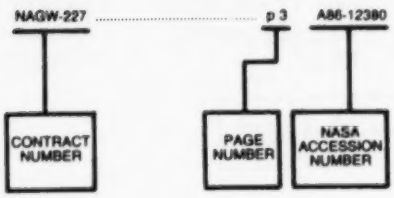

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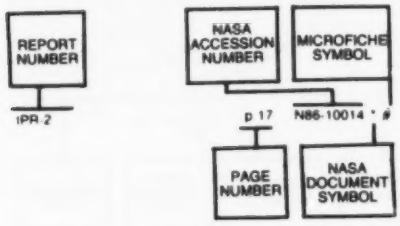

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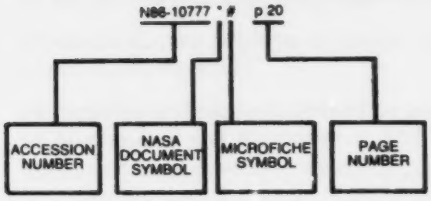

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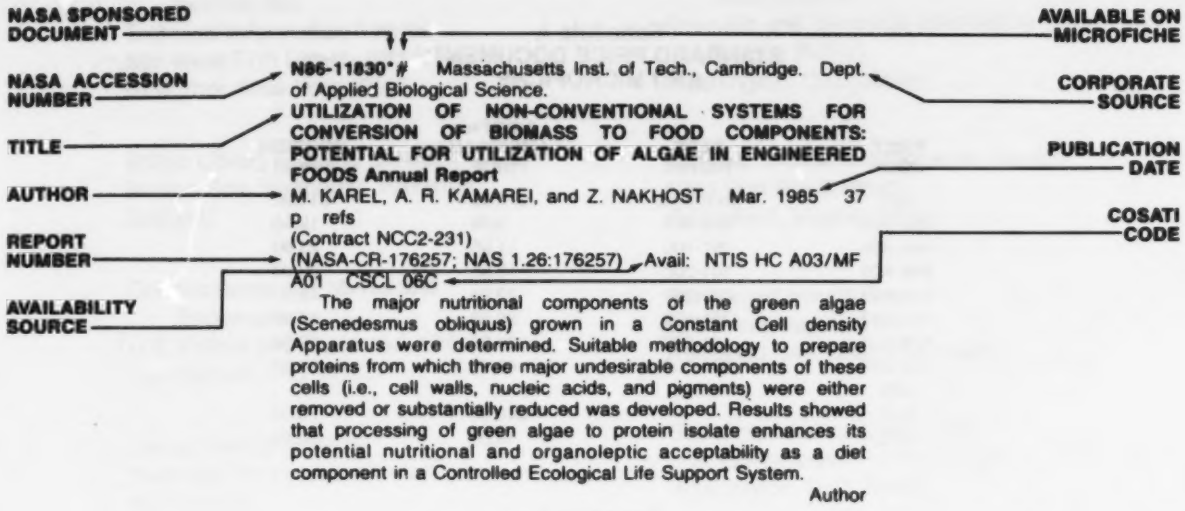
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(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
AVAILABILITY SOURCE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

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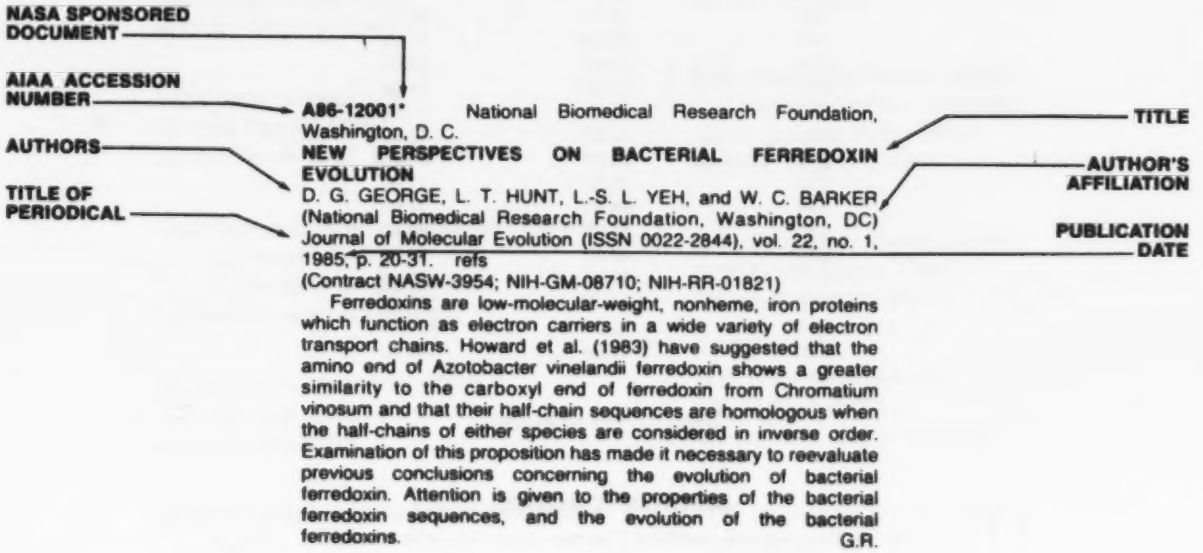
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AIAA ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
AUTHORS
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
AUTHOR'S AFFILIATION
TITLE OF PERIODICAL
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)
PUBLICATION DATE
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

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Aerospace Medicine and Biology Continuing Bibliography (Supplement 284)	May 1986
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	10. Work Unit No.
9. Performing Organization Name and Address National Aeronautics and Space Administration Washington, D.C. 20546	11. Contract or Grant No.
	13. Type of Report and Period Covered
12. Sponsoring Agency Name and Address	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

This bibliography lists 148 reports, articles, and other documents introduced into the NASA scientific and technical information system in April 1986.

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STAR (N-10000 Series)	N86-18284 – N86-21499
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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 285)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in May 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 319 reports, articles and other documents announced during May 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 54 Man/System Technology and Life Support Includes human engineering; biotechnology; and space suits and protective clothing.	137
Category 55 Planetary Biology Includes exobiology; and extraterrestrial life.	154

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AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 285)

JUNE 1986

51

LIFE SCIENCES (GENERAL)

Includes genetics.

A86-23225
INDIRECT OBSERVATION BY C-13 NMR SPECTROSCOPY OF A NOVEL CO2 FIXATION PATHWAY IN METHANOGENS
J. N. S. EVANS, C. J. TOLMAN, and M. F. ROBERTS (MIT, Cambridge, MA) Science (ISSN 0036-8075), vol. 231, Jan. 31, 1986, p. 488-491. Research supported by the Gas Research Institute. refs
(Contract NIH-RR-00995; NSF C-670)

A86-23311* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INCREASED GLUCONEOGENESIS IN RATS EXPOSED TO HYPER-G STRESS
B. C. DALIGCON, J. OYAMA, and K. HANNAK (NASA, Ames Research Center, Moffett Field, CA) Life Sciences (ISSN 0024-3205), vol. 37, no. 3, 1985, p. 235-241. refs

The effect of gluconeogenesis on the levels of plasma glucose and liver glycogen was studied in rats exposed to hyper-G stress. Incorporation of lactate, alanine, or glycerol, labeled with C-14, into plasma glucose and liver glycogen was measured in rats centrifuged at 3.1 G for 0.25, 0.50, and 1.0-hr periods, and was compared to noncentrifuged controls injected with appropriate glycogen precursors. It was found that exposure to G-stress leads to increased incorporation from all three substrates into both plasma glucose and liver glycogen. These early incorporation increases were blocked upon pre-G administration of 5-methoxyindole-2-carboxylic acid, a gluconeogenesis inhibitor, or propanolol, a beta-adrenergic blocker, as well as by adrenodemedullation. Results indicate that the rapid rise in plasma glucose, as well as in liver glycogen in rats exposed to hyper-G stress is due to an increased rate of gluconeogenesis, and that epinephrine, released in response to hyper-G-induced activation of the sympathetic-adrenal system, plays a dominant role during the early stages of hyper-G stress. I.S.

A86-23490
MORPHOLOGICAL CHANGES IN SOME INTERNAL ORGANS OF GUINEA PIGS DUE TO THE EFFECT OF A CONSTANT ELECTROMAGNETIC FIELD [MORFOLOGICHESKIE IZMENENIIA NEKOTORYKH VNUTRENNIKH ORGANOV MORSKIKH SVINOK POD VOZDEISTVIEM POSTOIANNOGO ELEKTROMAGNITNOGO POLIA]
R. V. KAPANADZE, D. D. TVILDIANI, Z. B. TSAGARELI, N. G. GORDADZE, T. G. GAPRINDASHVILI (AN GSSR, Nauchno-Issledovatel'skii Institut Eksperimental'noi Morfologii, Tbilisi; Nauchno-Issledovatel'skii Institut Kardiologii, Georgian SSR) et al. Akademiia Nauk Gruzinskoi SSR, Soobshcheniia (ISSN 0132-1447), vol. 119, July 1985, p. 189-192. In Russian. refs

A86-23491
MECHANISM OF NORADRENALINE EFFECT ON THE SKIN THERMORECEPTORS [O MEKHANIZME DEISTVIIA NORADRENALINA NA KOZHNYE TERMORETSEPTORY]
T. V. KOZYREVA and I. N. SINDAROVSKAIA (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1344-1350. In Russian. refs

Skin surface and intradermal temperatures, rectal temperature, and oxygen consumption were recorded continuously in cold-adapted and nonadapted rats following the injection of noradenaline by either intraperitoneal or intraarterial routes. Among the measured parameters, only the intradermal temperature response depended upon the route of administration: intraperitoneal injection caused, after a short latent period, an increase in temperature, whereas interaarterial administration led to a decrease in temperature, followed by a gradual increase. All other measured parameters have displayed increases after either type of injection, and in the cold-adapted animals, all noradrenaline-effected changes were enhanced compared to nonadapted animals. Injections of noradrenaline by either route were shown earlier (Kosyreva, 1984) to equally activate skin cold receptors, indicating by this uniformity that their activation was independent of the capillary tonus, which causes the observed intradermal temperature changes. A mechanism of direct hormonal activation of the receptor membranes is suggested. I.S.

A86-23492
EFFECT OF HYPEROXIC GAS MIXTURES ON OXYGEN MASS TRANSFER THROUGH THE HEMATOPARENCHYMATOUS BARRIER [VLIIANIE GIPEROKSICHESKIKH GAZOVYKH SMESEI NA MASOPERENOS KISLORODA CHEREZ GEMOTOPARENKHIMATOZNYI BAR'ER]
V. A. BEREZOVSKII and V. I. NOSAR (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1403-1407. In Russian. refs

The effect of inhaling oxygen-enriched gas mixtures, containing 80 pct O2 and 20 pct of either N2 or He, on the oxygen permeability through the blood-tissue barrier was studied in rabbits under local anesthesia. Hind-limb arterial and venous oxygen pressures, O2 pressure in the muscle tissue, and other parameters of O2 blood-tissue permeability were measured before and after application of the hyperoxic mixtures. Inhalation of either hyperoxic mixture was found to cause a drop of O2 transport to about one-fifth of the control values, indicating that the hyperoxia per se evokes a protective reaction against hyperoxygenation. I.S.

A86-23493
INTERACTION OF THE THERMORECEPTOR AND VESTIBULAR SIGNALS IN THE REGULATION OF THE ACTIVITY OF FLEXOR AND EXTENSOR MOTOR NUCLEI DURING COLD TREMORS [VZAIMODEISTVIE TERMORETSEPTIVNOI I VESTIBULIARNOI SIGNALIZATSII V REGULIATSII AKTIVNOSTI FLEKSORNOGO I EKSTENZORNOGO DVIGATEL'NYKH IADER VO VREMIA KHOLODOVOGO TREMORA]
IU. V. LUPANDIN and G. I. KUZMINA (Petrozavodskii Gosudarstvennyi Universitet, Petrozavodsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Nov. 1985, p. 1433-1438. In Russian. refs

A86-23553* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION LIFE SCIENCES GUIDELINES FOR NONHUMAN EXPERIMENT ACCOMMODATION
R. ARNO (NASA, Ames Research Center, Moffett Field, CA) and J. HILCHEY (NASA, Marshall Space Flight Center, Huntsville, AL) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. refs
(SAE PAPER 851370)

Life scientists will utilize one of four habitable modules which constitute the initial Space Station configuration. This module will be initially employed for studies related to nonhuman and human life sciences. At a later date, a new module, devoted entirely to nonhuman life sciences will be launched. This report presents a description of the characteristics of a Space Station laboratory facility from the standpoint of nonhuman research requirements. Attention is given to the science rationale for experiments which support applied medical research and basic gravitational biology, mission profiles and typical equipment and subsystem descriptions, issues associated with the accommodation of nonhuman life sciences on the Space Station, and conceptual designs for the initial operational capability configuration and later Space Station life-sciences research facilities. G.R.

A86-23568
SIMULATION MODEL FOR PLANT GROWTH IN CONTROLLED ENVIRONMENT SYSTEMS
D. C. RAPER, JR. and M. WANN (North Carolina State University, Raleigh) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 85-1390)

The development of a model which will assist in the designing of a crop production system is discussed. The utilization of the abstraction hierarchy theory of Mesrovic et al., (1970) to define the level of hierarchy for a crop production system is studied. The deterministic model for plant growth, which was developed, describes the growth of plants subjected to various environment conditions. The model analyzes the processes of: (1) photosynthetically active radiation, (2) translocation between carbohydrate pools in leaves, stems, and roots, (3) flow of energy and carbon, and (4) aging of tissues. The effect of temperature on photosynthesis, respiration, aging, and growth rates, and the translocation coefficients is investigated. The applications of nonlinear differential equations to the flow of energy and carbon, and of experimental data to the translocation coefficients and aging rates are examined. The structure of the model provides the capacity for interpolating among the levels within a crop production system of a controlled ecological life support system. I.F.

A86-23572
THE C23A SYSTEM, AN EXAMPLE OF QUANTITATIVE CONTROL OF PLANT GROWTH ASSOCIATED WITH A DATA BASE
M. ANDRE, A. DAGUENET, D. MASSIMINO, and A. GERBAUD (CEA, Centre d'Etudes Nucleaires de Cadarache, Saint-Paul-les-Durance, France) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. refs
(SAE PAPER 851395)

The C23A (Chambres de Culture Automatique en Atmospheres Artificielles) system which is used for the controlled study of plant physiology is described. The modular plant growth chambers and instruments for the study of canopies, isolated plants with a separate root compartment, and acquatic plants are examined. The uses of a mass spectrometer and a CO2 infrared analyzer to monitor shoot and root atmospheres, and of a chemical autoanalyzer to calculate uptake rates for elements are analyzed. The microprocessors, central computer, and satellite microcomputers of the computer system control the culture chambers and measuring systems, provide visual or graphical control, and store all data in short- and long-term files. Examples of experimental studies conducted in the C23A system evaluating the photosynthesis and photorespiration of various plants are presented. I.F.

A86-23574
DESCRIPTION OF CONCEPT AND FIRST FEASIBILITY TEST RESULTS OF A LIFE SUPPORT SUBSYSTEM OF THE BOTANY FACILITY BASED ON WATER RECLAMATION
H. R. LOESER (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p.
(SAE PAPER 851397)

A water reclamation module which controls the temperature and humidity of the air within the Botany Facility is proposed. The water reclamation process is achieved by condensation with a heat pump and capillary transport of the condensate back into the soil of the plant growth chamber. An analysis is conducted to calculate the circulation flow rates and specific power consumption. The design of a prototype water reclamation module which utilizes a Peltrier element and a condenser/wick assembly to return elements to the soil and the experimental conditions are described. The module is evaluated in terms of condensation rate and condensor temperature as a function of the cold side mass of flow rate; the water reclamation process proves applicable for the Botany Facility. I.F.

A86-23996
MOLECULAR ARCHAEOLOGY OF THE MITOCHONDRIAL GENOME
R. OBAR (Boston University, MA) and J. GREEN (Tennessee, University, Knoxville) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 3, 1985, p. 243-251. refs
(Contract NSF PCM-82-03004)

A stepwise model for the net transfer of nucleic acid sequences between nonhomologous genomes has been developed. This model is then used to explain the two major patterns in the evolutionary history of mitochondrial genomes: the gross reduction of the number of genes, and the subsequent acquisition of introns. Author

A86-23997
A MULTIVARIATE STUDY OF THE RELATIONSHIP BETWEEN THE GENETIC CODE AND THE PHYSICAL-CHEMICAL PROPERTIES OF AMINO ACIDS
M. SJOSTROM and S. WOLD (Umea Universitet, Sweden) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 3, 1995, p. 272-277. Research supported by the Naturvetenskapliga Forskningsradet. refs

A86-23998* Indiana Univ., Bloomington.
SEQUENCE OF THE 16S RRNA GENE FROM THE THERMOACIDOPHILIC ARCHAEBACTERIUM SULFOLOBUS SOLFATARICUS AND ITS EVOLUTIONARY IMPLICATIONS
G. J. OLSEN, N. R. PACE (Indiana University, Bloomington), M. NUELL, B. P. KAINE, R. GUPTA (Illinois, University, Urbana) et al. Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 301-307. refs
(Contract NIH-GM-34527; NSG-7044)

A86-23999
SEQUENCE DIVERGENCE OF AN ARCHAEBACTERIAL GENE CLONED FROM A MESOPHILIC AND A THERMOPHILIC METHANOGEN
P. T. HAMILTON and J. N. REEVE (Ohio State University, Columbus) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 351-360. Research supported by the Gas Research Institute. refs
(Contract DE-AC02-81ER-10945; EPA-CR-810340)

A86-24000* California Univ., Berkeley.
A CHANGE IN THE GENETIC CODE IN MYCOPLASMA CAPRICOLUM
T. H. JUKES (California, University, Berkeley) Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 4, 1985, p. 361, 362. refs
(Contract NGR-05-003-460)

Mycoplasma capricolum was previously found to use UGA instead of UGG as its codon for tryptophan and to contain 75 percent A + T in its DNA. The codon change could have been due to mutational pressure to replace C + G by A + T, resulting in the replacement of UGA stop codons by UAA, change of the anticodon in tryptophan tRNA from CCA to UCA, and replacement of UGG tryptophan codons by UGA. None of these changes should have been deleterious. Author

A86-24136
METABOLIC ASPECTS OF THE PROBLEM OF STRESS IN SPACE FLIGHT [METABOLICHESKIE ASPEKTY PROBLEMY STRESSA V KOSMICHESKOM POLETE]
R. A. TIGRANIAN Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 52), 1985, 224 p. In Russian. refs

The character of the possible stress response to space flight is examined along with the nature of adaptation to this type of stress. Data are presented on changes of stress indicators (catecholamines, hormones, peptides, polyamines, enzymes, lipids, etc.) in various organs and tissues of rats on prolonged space flights (18.5-22 days) on the Cosmos biosatellites. In particular, the combined effect of weightlessness and ionizing radiation was studied on Cosmos-690, and the effect of weightlessness and artificial gravity was studied on Cosmos-936. Stress-response mechanisms associated with prolonged stay in weightlessness are considered along with the subsequent readaptation to terrestrial gravity. B.J.

A86-24144
IONIZING RADIATION AND BLOOD VESSELS [IONIZIRUIUSHCHIE IZLUCHENIIA I KROVENOSNYE SOSUDY]
E. I. VOROBEV and R. P. STEPANOV Moscow, Energoatomizdat, 1985, 296 p. In Russian. refs

Results of clinical and experimental studies on the effects of ionizing radiation on the vascular system are presented. Effects of low-level chronic exposure, and both short-term and delayed effects of radiation therapy are discussed, including organ-specific, as well as general, vascular and hemodynamic changes. Laboratory studies of primary and secondary effects of radiation on the aortal and capillary endothelia are reported, and the processes of intracellular and tissue repair in the capillary endothelium are described. Special attention is paid to studies concerned with the prevention and treatment of radiation sickness. I.S.

A86-24308
HOW DOES SKELETAL MUSCLE EFFECTIVELY FUNCTION BOTH IN THE CASE OF POSTURE MAINTENANCE AND TWITCH MOVEMENTS? [ZA SCHET CHEGO SKELETNAIA MYSHTSA EFFEKTIVNO RABOTAET KAK PRI PODDERZHANII POZY, TAK I V FIZICHESKIKH DVIZHENIIAKH]
V. S. GURFINKEL and IU. S. LEVIK (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1241-1245. In Russian. refs

Experiments were conducted in which electric stimuli were used to simulate pulsed sequences of motor unit under the twitch and tonic activity of muscles. The results indicate that skeletal muscle functions effectively in both postural and twitch modes not only because of the presence of fast and slow fibers, but also because the contractile properties of one and the same fibers can change. B.J.

A86-24309
ANTISTRESS EFFECT OF 1-CHLORMETHYLSILITRANE [ANTISTRESSNYI EFFEKT 1-KHLORMETILSILATRANA]
V. V. MALYSHEV, T. P. DVORETSKAIA, V. B. KAZIMIROVSKAIA, N. S. KAMENEVA, E. IU. SMAKOLINA (Irkutskii Gosudarstvennyi Meditsinskii Institut; AN SSSR, Institut Organicheskoi Khimii, Irkutsk, USSR) et al. Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1249-1251. In Russian. refs

The effect of 1-chlormethylsilitrane (1-CMS) on the development of emotional stress was studied in 80 white male rats. Results indicate that a preliminary administration of 1-CMS prevents the stress activation of the adrenergic and hypophyseal-adrenal systems, i.e., this drug has powerful antistress effect. It is concluded that the further study of the adaptogenic properties of silicon compounds is of interest in connection with the production of stress-preventing drugs. B.J.

A86-24323
THE TRYPTOPHANYL-TRNA SYNTHETASES FROM EUROCARYOTES, PROCARYOTES, AND ARCHEBACTERIA HAVE A COMMON ANTIGENIC DETERMINANT [TRIPTOFANIL-TRNK-SINTETAZY EUKARIOT, PROKARIOT I ARKHEBAKTERII IMEIUT OBSHCHIUU ANTIGENNUIU DETERMINANTU]
T. A. ZARGAROVA, S. F. BERESTEN, O. O. FAVOROVA, and L. L. KISELEV (AN SSSR, Institut Molekuliarnoi Biologii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 6, 1985, p. 1484-1486. In Russian. refs

A86-24368
HYPNOGENIC ACTIVITY OF A CYCLIC STRUCTURAL ANALOG OF DELTA-SLEEP-INDUCING PEPTIDE [GIPNOGENNAIA AKTIVNOST' TSIKLICHESKOGO STRUKTURNOGO ANALOGA DEL'TA-SON-INDUTSIRUIUSHCHEGO PEPTIDA]
V. M. KOVALZON (AN SSSR, Institut Evoliutsionnoi Morfologii i Ekologii Zhivotnykh, Moscow, USSR) and I. I. MIKHALEVA (AN SSSR, Institut Bioorganicheskoi Khimii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 286, no. 1, 1986, p. 230-232. In Russian. refs

It is shown that a cyclic analog of delta-sleep-inducing peptide (DSIP) has the same hypnogenic effect on rabbits in the case of central administration as linear analogs that are stable with respect to aminopeptidases. This is evidently due to two factors: (1) a heightened stability of the cyclic analog with respect to proteolysis, and (2) an adequate conformational structure. This supports the hypothesis that the quasi-cyclic conformation of DSIP participates in the regulation of the sleep-wakefulness cycle. B.J.

A86-24422
POSTRADIATION DISORDERS OF PERIPHERAL-NERVE REGENERATION AND THE ROLE OF FREE-RADICAL OXIDATION PRODUCTS IN THE APPEARANCE OF THESE DISORDERS [POSTRADIATSIONNYE NARUSHENIIA REGENERATSII PERIFERICHESKOGO NERVA I ROL' PRODUKTOV SVOBODNORADIKAL'NOGO OKISLENIIA V IKH VOZNIKNOVENII]
V. N. RADLINSKAIA, I. A. ZHUTAEV, V. N. BOBYREV, and O. N. VOSKRESENSKII (Poltavskii Meditsinskii Stomatologicheskii Institut, Poltava, Ukrainian SSR) Radiobiologia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 728-732. In Russian. refs

The effect of local unilateral gamma-radiation and of alimentary antioxidant deficiency on nerve regeneration was studied in guinea pigs subjected to bilateral severance of sciatic nerves and maintained on either regular (i.e., antioxidant-supplemented) or antioxidant-free diet for 80 days prior to irradiation. All irradiated animals exhibited peroxidation syndrome, manifested by the appearance of free-radical oxidation products in blood components, as well as morphological abnormalities in the irradiated regenerating nerve (short and/or abnormally-shaped axons, and demyelination). In the antioxidant-deficient animals the extents of both peroxidation syndrome and morphological abnormalities were enhanced. Moreover, the nerve regeneration was now observed in both irradiated and contralateral sciatic nerves. I.S.

A86-24423
MECHANISM OF CIRCULATORY DISORDERS IN ANIMALS SUBJECTED TO HIGH-DOSE IRRADIATION [K MEKHANIZMU RASSTROISTV KROVOOBRASHCHENIIA U ZHIVOTNYKH, OBLUCHENNYKH V BOL'SHIKH DOZAKH]
T. D. POZHARISSKAIA, T. P. VASILEVA, E. N. SOKOLOVA, and I. I. ALEKSEEVA (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 763-767. In Russian. refs

The effect of lethal doses of gamma-radiation on the vascular system of dogs and rats was studied by monitoring postradiation changes in blood-cell count and morphology, blood coagulation indices, and the rate of peripheral blood flow. A single radiation dose (of 180 gR for rats and in the 18-145 gR range for dogs) led to the abrupt and sharp decline of white blood cell count, which was accompanied by multiple hemorrhages in the intestinal mucosa, the brain stem, and cerebral membranes, and by the appearance of disseminated intravascular hypercoagulation. The rate of capillary circulation (in the rat appendix) was found to decrease to one-half to one-quarter of the original rate. The significance of the early onset of hypercoagulation in clinical manifestations of intestinal and cerebral forms of acute radiation sickness is discussed. I.S.

A86-24424
EVALUATION OF RADIATION-INDUCED DAMAGE IN THE ERYTHROCYTE MEMBRANES OF RATS AND DOGS ACCORDING TO CHANGES IN THE ERYTHROCYTE SEDIMENTATION BEHAVIOR [OTSENKA RADIATSIONNYKH POVREZHDENII MEMBRAN ERITROTSITOV PO IZMENENIIU IKH SEDIMENTATSIONNYKH SVOISTV U KRYS I SOBAK]
V. F. MIKHAILOV and L. A. POTEMKIN (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 784-786. In Russian.

A86-24425
EFFECT OF NONIONIZING MICROWAVE RADIATION ON THE AUTOIMMUNE REACTIONS AND ANTIGENIC STRUCTURE OF SERUM PROTEINS [VLIIANIE NEIONIZIRUIUSHEI MIKROVOLNOVOI RADIATSII NA AUTOIMMUNNYE REAKTSII I ANTIGENNUIU STRUKTURU SYVOROTOCHNYKH BELKOV]
G. I. VINOGRADOV, G. V. BATANOV, G. M. NAUMENKO, A. D. LEVIN, and S. I. TRIFONOV (Nauchno-Issledovatel'skii Institut Obshchei i Kommunal'noi Gigieny, Kiev, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 25, Nov.-Dec. 1985, p. 840-843. In Russian. refs

A86-24610#
THE LIFE SCIENCES ON BOARD OF SPACELAB D1 [DIE LEBENSWISSENSCHAFTEN AN BORD VON SPACELAB D1]
S. PAECH Luft- und Raumfahrt (ISSN 0173-6264), vol. 6, 4th Quarter, 1985, p. 106, 108-110. In German.

During the last few years, it was realized that a study of the effects of weightlessness can be of fundamental importance even in the area of biology, taking into account biological organisms from a cell to a human being. This importance is related to the fact that only experiments under conditions of weightlessness can provide information of an indirect nature regarding the mechanisms by which gravity affects biological organisms. For this reason, biological experiments of very different chracteristics formed a part of the D1 mission. The most important of these experiments are discussed, taking into account studies involving cells and other microorganisms, hatching experiments concerning frogs and flies, the effects of weightlessness on germinating plants, questions regarding the control of the transport of hormones during cell growth in plants by gravity, the behavior of the human body during the transition to weightlessness conditions, and functional disturbances caused by conditions of weightlessness. G.R.

A86-25659* Washington Univ., St. Louis, Mo.
EFFECT OF ROTOPOSITIONING ON THE GROWTH AND MATURATION OF MANDIBULAR BONE IN IMMOBILIZED RHESUS MONKEYS
D. J. SIMMONS, C. PARVIN, K. C. SMITH, P. FRANCE (Washington University, St. Louis, MO; USAF, Aerosspace Medical Research Laboratories, Wright-Patterson AFB, OH), and L. KAZARIAN Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 157-161. refs
(Contract NAGW-301)

The rates of bone formation and mineralization in the mandibular cortex of juvenile Rhesus monkeys exposed to immobilization/rotopositioning are evaluated. The monkeys were restrained in a supine position and rotated 90 deg every 30 minutes through a full 360 deg for 14 days. The microscopic distribution of mineral densities in osteonal bone and the porosity of cortical bone are studied using microradiographs, and osteon closure rates are assessed using tetracycline labeling; normal distributions of osteons of different mineral density and cortical bone porosity values are observed. It is concluded that 14 days of immobilization/rotopositioning did not cause abnormal changes in osteon mineralization, cortical porosity, and osteon closure rates. I.F.

A86-25660* Louisville Univ., Ky.
THYMIC INVOLUTION IN THE SUSPENDED RAT - ADRENAL HYPERTROPHY AND GLUCOCORTICOID RECEPTOR CONTENT
J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 162-167. refs
(Contract NSG-2325; NAGW-70)

The relationship between thymic involution and adrenal hypertrophy is studied. The thymus, adrenal glands, and tissue water content are evaluated in male Sprague rats suspended in antiorthostatic (AO) or orthostatic (O) positions. A 50 percent decrease in the wet weight of the thymus and hypertrophy of the adrenal glands are observed during the seven days of AO suspension. After seven days of recovery the thymus weight is increased to control level; however, the hypertrophy of the adrenal glands remains unchanged. Thymic and renal responses in O positioned rats are similar to AO reactions. Thymic glucocorticoid (GC) receptor concentrations in the rats are analyzed; a 20 percent decrease in GC receptor site concentration, which is related to thymic involution, is detected in both AO and O rats. It is concluded that there is a temporal correlation between thymic involution and adrenal hypertrophy, which is not affected by AO positioning, and thymic involution is not associated with an increased sensitivity to GC. I.F.

A86-26180
PERMANENT DISTORTION OF POSITIONAL SYSTEM OF XENOPUS EMBRYO BY BRIEF EARLY PERTURBATION IN GRAVITY
J. COOKE (National Institute for Medical Research, London, England) Nature (ISSN 0028-0836), vol. 319, Jan. 2, 1986, p. 60-63. refs

N86-18949*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 3 Final Report
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., J. E. ROWE, ed., and R. TEETER, ed. Dec. 1985 102 p
(Contract NASW-3676)
(NASA-CR-3922(03); NAS 1.26:3922(03)) Avail: NTIS HC A06/MF A01 CSCL 06B

This is the third issue of NASA's USSR Space Life Sciences Digest. Abstracts are included for 46 Soviet periodical articles in 20 areas of aerospace medicine and space biology and published in Russian during the second third of 1985. Selected articles are illustrated with figures and tables from the original. In addition, translated introductions and tables of contents for seven Russian books on six topics related to NASA's life science concerns are

presented. Areas covered are adaptation, biospherics, body fluids, botany, cardiovascular and respiratory systems, endocrinology, exobiology, gravitational biology, habitability and environmental effects, health and medical treatment, immunology, life support systems, metabolism, microbiology, musculoskeletal system; neurophysiology, nutrition, perception, personnel selection, psychology, radiobiology, and space physiology. Two book reviews translated from the Russian are included and lists of additional relevant titles available in English with pertinent ordering information are given. Author

N86-18950*# National Aeronautics and Space Administration, Washington, D.C.
SUMMARIES OF 1984-85 NASA SPACE-GRAVITATIONAL BIOLOGY ACCOMPLISHMENTS
T. W. HALSTEAD, comp., F. R. DUTCHER, comp. (George Washington Univ., Washington, D.C.), and L. G. PLEASANT, comp. (George Washington Univ., Washington, D.C.) Dec. 1985 135 p refs
(Contract NASW-3165)
(NASA-TM-88379; NAS 1.15:88379) Avail: NTIS HC A07/MF A01 CSCL 06B

Individual technical summaries of research projects of NASA's Space/Gravitational Biology Program are presented. The summaries for each project include a description of the research, a listing of the accomplishments, and an explanation of the significance of the accomplishments. Bibliographies for each project are also included. Author

N86-18951# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
METABOLISM OF T-2 MYCOTOXIN BY CULTURED CELLS
L. R. TRUSAL 18 Sep. 1985 20 p
(Contract DA PROJ. 3M1-61102-BS-12)
(AD-A159678; AD-E801193) Avail: NTIS HC A02/MF A01 CSCL 06T

T-2 mycotoxin is a small (i.e. 466 daltons), non-protein toxin. We studied its metabolism in Chinese hamster ovary (CHO) cells, African green monkey kidney (VERO) cells, human fibroblasts, and L-cells. Confluent cells were exposed to (3H)-T-2(0.01 micrograms/ml) for 1 hr at 37 C. CHO and VERO cells metabolized T-2 a greater extent than the other two cell types. In CHO, fibroblast and L-cells, the major metabolite was HT-2 toxin while, in VERO cells, an unknown metabolite, more polar than T-2, was the major metabolite. Cell and media extracts of CHO and VERO cells revealed smaller amounts of T-2 triol, T-2 tetraol and several unknowns. In both cell types, metabolites were detected in labeled media by 1 hr and in increasing amounts in unlabeled media by 4 hr. Under the above conditions, 37 to 58% of the radioactivity remained as T-2 toxin after 4 hr in both cell types. The data suggest that some cultured cell lines possess enzyme systems capable of limited metabolism of T-2 mycotoxin to a variety of known and as yet unidentified metabolites. GRA

N86-18952# OPTRA, Inc., Peabody, Mass.
RAPID IDENTIFICATION OF MICRO-ORGANISMS Final Report, 5 Apr. 1982 - 31 May 1985
M. HERCHER, K. MEAD, and H. M. SHAPIRO 26 Aug. 1985 27 p
(Contract DAAG29-82-C-0011)
(AD-A159945; ARO-18828.2-LS-S) Avail: NTIS HC A03/MF A01 CSCL 06M

Flow cytometric parameters for the rapid identification of micro-organisms have been investigated. These include fluorescent and incident light scatter signals indicative for: (1) cell size, (2) cell structure, (3) DNA content, (4) RNA content, (5) total protein, (6) surface antigens, (7) intracellular enzyme, activity and 8) viability (by membrane potential criteria). Several simplified instrumentation techniques for flow cytometry were also successfully explored. GRA

N86-18953# State Univ. of New York, Brooklyn.
IMMUNOMODULATION BY PROTEINS OF BORDETELLA PERTUSSIS Annual Report, No. 1, 1 Aug. 1984 - 31 Jul. 1985
B. M. SULTZER and J. P. CRAIG 30 Aug. 1985 11 p
(Contract N00014-84-K-0693)
(AD-A160078) Avail: NTIS HC A02/MF A01 CSCL 06E

A selected number of immunobiologically active polypeptides have been found to be closely associated with, but separable from the lipopolysaccharide endotoxin (LPS) in the outer membrane of Gram-negative bacteria. Initially these endotoxin associated proteins (EP) from Bordetella pertussis, Salmonella typhi and Vibrio cholerae were found to enhance the immune response to cholera enterotoxin after immunization with cholera toxiod. At the cellular level, B. pertussis EP (PEP) is a mitogen and polyclonal activator of antibody producing B-lymphocytes of C3H/HeJ mouse lymphocytes which are unresponsive to LPS. PEP can adjuvant in vitro the production of IgM antibody to cholera toxin and sheep erythrocytes by mouse splenic lymphocytes. In control experiments we have shown that the activity of PEP cannot be neutralized by the cationic polypeptide polymyxin B which specifically neutralizes the lipid A component of LPS that is responsible for the simulating properties of LPS. In addition, our tests indicate PEP does not contain any detectable lymphocytosis promoting factor (LPF) activity. Preliminary experiments have shown that extracts of B. pertussis which contain both LPS and associated proteins are protective in the standard mouse model used for testing the efficacy pertussis vaccines. GRA

N86-18954# Minnesota Univ., Minneapolis.
MOLECULAR APPROACHES TO SELECTIVE IMMUNIZATION Final Report, 15 Oct. 1984 - 31 Jul. 1985
F. H. BACH 30 Sep. 1985 6 p
(Contract N00014-85-K-0004)
(AD-A160141) Avail: NTIS HC A02/MF A01 CSCL 06A

The sequence polymorphism underlying T lymphocyte recognition as related to the DR alpha beta dimer has been studied using cDNA libraries. DR beta genes form homozygous typing cells expressing the same serologically-defined DR antigen but differing in their Dw subtype, have allowed the pinpointing of single amino acid differences underlying this allotypic variation in some combinations, and two to three amino acid differences in others. Author (GRA)

N86-18955# Army Environmental Hygiene Agency, Aberdeen Proving Ground, Md.
MAGNETIC-FIELD HAZARDS BIBLIOGRAPHY, 2ND EDITION
D. H. SLINEY and R. BISHOP Sep. 1985 31 p
(AD-A160154) Avail: NTIS HC A03/MF A01 CSCL 20C

The purpose of this bibliography was to prepare in the interest of providing a source of references for those interested in the biological effects and the evaluation of hazards associated with magnetic fields. This is the second published edition of Magnetic-Fields Hazards Bibliography. The 364 references are divided into groups as shown in the Table of contents: measurement techniques, environmental levels, and applications in sciences and industry, biological studies at the molecular, cellular and subvertebrate level, biological studies: vertebrates, and biological studies: man and neural effects. GRA

N86-18956# Minnesota Univ., Minneapolis.
SEQUENCE POLYMORPHISM OF HLA-DR BETA 1 ALLELES RELATING TO T CELL-RECOGNIZED DETERMINANTS
J. S. CAIRNS, J. M. CURTSINGER, C. A. DAHL, S. FREEMAN, and B. J. ALTER 1985 14 p
(Contract N00014-85-K-0004; PHS-AI-17687; PHS-AI-18326; PHS-AI-19007)
(AD-A160237) Avail: NTIS HC A02/MF A01 CSCL 06C

HLA class II molecules are a highly polymorphic family of dimeric cell surface proteins primarily involved in regulating T cell responses to extrinsic antigens. To define regions of class II molecules involved in T cell recognition, we have compared sequences of three HLA-DR Beta cDNA clones obtained from cells that all express the same serologically defined determinants but differ in

terms of T cell-recognized specificities. The comparisons indicate that very few (one to four) nucleotides differ between what are almost certainly alleles of the DR beta 1 Locus. All differences were in the first domain of the molecule and all localized to a region from amino acids 71-86. Since all differences were found only in this region of the molecules, and since DR alpha chains seem to be relatively nonpolymorphic, these positions in the DR beta chain must play a major role in influencing T cell recognition of the DR molecule. Serological and molecular cloning experiments have shown that there are three families of class II molecules within the HLA complex, termed DP, DQ, and DR. For the DR4-DRw53 haplotype which we have studied, within the DR family, one alpha and three complete beta genes are known; one beta gene is a pseudogene. At least two DR alpha beta dimers are expressed. GRA

N86-18957# North Dakota State Univ., Fargo. Dept. of Zoology.

IDENTIFICATION AND QUANTIFICATION OF THE WATER-SOLUBLE COMPONENTS OF JP-4 AND A DETERMINATION OF THEIR BIOLOGICAL EFFECTS UPON SELECTED FRESHWATER ORGANISMS Final Technical Report, 30 Sep. 1978 - 27 Feb. 1984

J. D. BRAMMER and R. L. PUYEAR 1 Jul. 1985 14 p
(Contract AF-AFOSR-3709-78)
(AD-A160271; AFOSR-85-0743TR) Avail: NTIS HC A02/MF A01 CSCL 07C

This final technical report includes a brief summary of research performed, results obtained, graduate students supported and theses written. One paper published was of a technical nature and describes the use of reverse-phase C-18 minicolumns for concentrating water soluble hydrocarbons derived from JP-4 jet fuel. Another technical paper using the same technique as the first was used to concentrate water soluble hydrocarbons produced by running an outboard motor in water. Analytical methods used for hydrocarbon separation and identification was GC, GC/MS and HPLC. The toxicity of toluene on the fathead minnow was the basis of three papers and a Ph.D. Thesis. It was found that the embryo was as sensitive to toluene than was the protolarvae or adult fish. This was determined using 96-hr LC50 tests. An MS thesis was written on the effects of toluene on gill structure in the fathead minnow adult. Little effect of toluene on gill structure was noted. A comparative study on the effects of administration of benzene, toluene and xylene isomeres on their in vitro metabolism and various drug metabolizing enzymes in rat liver, and the covalent binding of toluene to rat liver microsomes has resulted in one Ph.D. Thesis and the preparation of three manuscripts for publication. GRA

N86-18958# Massachusetts Inst. of Tech., Cambridge. Lab. of Neuroendocrine Regulation.

USE OF TYROSINE OR FOODS TO AMPLIFY CATECHOLAMINE RELEASE Interim Technical Report, 30 Sep. 1983 - 29 Sep. 1984

R. J. WURTMAN 12 Jun. 1985 13 p
(Contract AF-AFOSR-0366-83)
(AD-A160274; AFOSR-85-0742TR) Avail: NTIS HC A02/MF A01 CSCL 06A

An experimental system using rat caudate slices was used to measure the effects of tyrosine on neuronal activity. Studies demonstrated the importance of adequate tyrosine in sustaining dopamine release and provide the first evidence that when sufficient experimental tyrosine is not provided, its level within catecholaminergic nerve terminals actually declines. The data suggest that when a group of such neurons undergoes sustained activity, its requirements for tyrosine increase dramatically. In such circumstances, normal levels of plasma tyrosine may be in adequate to sustain function. Author (GRA)

N86-18959# Armed Forces Radiobiology Research Inst., Bethesda, Md.

HEMATOPOIESIS IN CONVENTIONAL MICE AFTER WOUND TRAUMA

G. D. LEDNEY, L. K. STEEL, H. M. GELSTON, JR., W. E. JACKSON, III, and E. D. EXUM 1985 5 p
(AD-A160436; AFRRI-SR85-23) Avail: NTIS HC A02/MF A01 CSCL 06E

Macrophages, granulocytes, and platelets serve in wound debridement, bacterial neutralization, and homeostasis. Replacement of such cells may involve perturbations in the clonogenic cell populations responsible for replenishing specific adult cell populations. For example, the human blood granulocyte progenitor cell compartment is increased following abdominal hysterectomy. In mice, skin wound trauma produced changes in the proliferative cell compartments of the hematopoietic tissues 24 hrs after injury. In this study we report: (1)some of our findings on the hematopoietic clonogenic cell changes in conventional mice after trauma, and (2) circulating substances which may mediate these changes. GRA

N86-19825# New Mexico Univ., Albuquerque. School of Medicine.

ULTRASENSITIVE DETECTION OF CHEMICAL SUBSTANCES Quarterly Report, 1 Jun. - 31 Aug. 1985

R. G. DEAN 31 Aug. 1985 4 p
(Contract N00014-82-K-0680; ARPA ORDER 4507)
(AD-A159996) Avail: NTIS HC A02/MF A01 CSCL 06A

In this reporting period we have continued to characterize monoclonal antibodies against ADhE-DFP. We have focused attention three monoclonals of interest. These are the V-16 antibody described in our previous report and two additional antibodies designated V-18 and D11B. The V-16 antibody demonstrates higher activity against AChE-DFP conjugate than against AChE alone. The V-18 and D11B antibodies showed higher activity against AChE than against the conjugate. In addition, the D11B antibody blocks AChE enzymatic activity in the Elman assay. Further study showed that these antibodies exhibit a different response to AChE-DFP conjugates on the basis that the AChE ages or loses and isopropoxy residue. The resulting phosphate diester has a charge, at normal pH, on oxygen. GRA

N86-19826# Massachusetts Univ., Worcester. Dept. of Medicine.

POTENTIAL FOR CROSS-REACTIVE PROTECTION USING PEPTIDES AND ADJUVANTS OR CARRIER MOLECULES Annual Report, 1 May 1984 - 30 Apr. 1985

F. A. ENNIS 1 Oct. 1985 8 p
(Contract N00014-83-K-0357; RR0-401)
(AD-A160360) Avail: NTIS HC A02/MF A01 CSCL 06E

We have demonstrated that a conserved portion of the HA2 subunit on the influenza virus hemagglutinin can induce a cytotoxic T lymphocyte response. This is a major development since it raises the possibility that this type of peptide could be used to provide protection that would be cross-reactive among influenza virus strains. The peptide we used was produced in E. coli using recombinant DNA techniques for the expression of segments of influenza viral genome. The molecule which stimulates this H-2 restricted cytotoxic T lymphocyte response is a fusion protein of the HA2 subunit of H1 virus (A/PR/8/34 H1N1), and the induced lymphocytes kill target cells infected with strains of influenza A virus possessing the H1 hemagglutinin irregardless of the years isolated (e.g. 1934, 1978), the results indicate that the HA2 subunit is a candidate for cross-reactive protection because there are substantial published data indicating that influenza virus induced cytotoxic T lymphocytes (Tc) are protective in challenged recipients. GRA

N86-19827# Texas Univ., Dallas. Center for Communication Disorders.
THE EFFECT OF IMPULSE INTENSITY AND THE NUMBER OF IMPULSES ON HEARING AND COCHLEAR PATHOLOGY IN THE CHINCHILLA
J. H. PATTERSON, JR., I. M. LOMBA-GAUTIER, and D. L. CURD Jun. 1985 191 p
(Contract DAMD17-80-C-0109; DA PROJ. 3F1-62777-A-878)
(AD-A161230; USAARL-85-3) Avail: NTIS HC A09/MF A01
CSCL 06S

Forty-one chinchillas, divided into seven groups, were exposed to 1, 10, or 100 noise impulses having peak intensities of 131 dB, 135 dB, 139 dB or 147 dB. Hearing thresholds were measured in each animal prior to exposure using an avoidance conditioning procedure. Threshold shifts were monitored at regular intervals over a 30 day postexposure period. A surface preparation of the cochlear sensory epithelia was performed approximately 90 days after exposure. There was generally an orderly relaxation between the amount of permanent threshold shift and the severity of exposure, and a general agreement between averaged histological data and the audiometric data. Detailed relations between temporary and permanent threshold shift, cochlear pathology, and exposure variables are discussed, as are the implications of these data to the development of exposure criteria. All tabulated individual animal data, averaged group data, and individual cochleograms are presented in Appendixes A through D. GRA

N86-19828# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
2 Jan. 1986 108 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-001) Avail: NTIS HC A06

A literature survey of life sciences, biomedical sciences, and behavioral sciences in the U.S.S.R. is presented. Some areas covered are agrotechnology, biochemistry, biophysics, biotechnology, environmental protection, epidemiology, food technology, genetics, human factors and immunology. Other areas are laser effects, medicine, microbiology, pharmacology and toxicology, physiology, public health and radiation biology.

N86-19829# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF EFFECTS OF MICROBIOLOGICAL MEANS OF PLANT PROTECTION ON ORGANISM
I. A. IVANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 1-9 2 Jan. 1986 refs Transl. into ENGLISH from Izvestiya Akademii Nauk Latviyskoy SSR (Riga, USSR), no. 6, Jun. 1985 p 76-81
Avail: NTIS HC A06

The microbiological method of combatting pests is very promising, which is explained by the ever growing interest in it in many countries. Nevertheless, before permitting the use of microbiological agents, it is necessary to thoroughly study the characteristics of microorganisms artificially introduced into the environment. Therefore, studying the effects of biological means of protecting agricultural crops on man and warm blooded animals is of scientific and practical interest. This emphasizes the importance of the correct approach to normalizing microbe preparations, which is of great importance not only from the point of view of hygiene and occupational pathology, but also of environmental protection. These effects of microorganisms on man and the environment are studied. Author

N86-19831# Joint Publications Research Service, Arlington, Va.
MICELLAR ENZYMOLOGY Abstract Only
K. MARTINEK, A. V. LEVASHOV, N. L. KLYACHKO, Y. L. KHMELNITSKIY, and I. V. BEREZIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 11 2 Jan. 1986 Transl. into ENGLISH from Biologicheskiye Membrany (Moscow, USSR), v. 2, no. 7, Jul. 1985 p 669-695
Avail: NTIS HC A06

In nature, enzymes function primarily in complex ensembles involving lipids, proteins, polysacchardies and other molecular components in solutions in which water is not the only dominant component. Enzyme catalysis therefore occurs in a microheterogeneous medium in which water acts as a regulator, determining the supermolecular structure of the catalytic reactor. Possible experimental methods of modeling the enzyme functions under such conditions are discussed, with particular attention given to such systems as proteolipid complexes and enzymes in organic solvents solubilized with phospholipids or detergents. The tasks of micellar enzymology are formulated and its relationship to membranology is discussed. The tasks include the study of the catalytic properties of solubilized enzymes as a function of degree of hydration; use of natural lipids as micelle forming components, allowing study of the mechanisms of regulation of lipid dependent enzymes; study of the interaction of enzymes in substrates insoluble in water; investigation of the dynamics of enzyme processes under conditions such that the substrate is distributed between water and organic solvents; study of cryoenzymatic processes occurring below the freezing point of water; and modeling of elementary biomembrane structure fragments with hydrated associations of protein and amphiphilic compound molecules. Author

N86-19838# Joint Publications Research Service, Arlington, Va.
LIGHT INDUCED DAMAGE TO ERYTHROCYTE MEMBRANE SENSITIZED BY TETRASULFOPHENYL PORPHIN
A. V. VOROBEY, T. N. VADETSKAYA, G. D. YEGOROVA, and Y. A. CHERNITSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 54-57 2 Jan. 1986 refs Transl. into ENGLISH from Vestsi Akademii Navuk BSSR: Seriya Biyalahichnykh Navuk (Minsk, USSR), no. 4, Jul. - Aug. 1985 p 103-105
Avail: NTIS HC A06

In recent times researchers have displayed a great interest in the possibility of using porphyrins for the diagnosis and photoradiation therapy of malignant neoplasmas. At the same time, there is great optimism regarding the use of hydrophilic porphyrins also. In order to devise effective methods of photoradiation therapy, it is necessary to investigate the mechanism of the photosensitized forms of cell damage. One of the basic targets of such damage is the cell membrane. The structural-functional changes in the erythrocyte membrane were studied by irradiating a suspension of erythrocyte shadows with red laser light in the presence of the hydrophilic porphyrin methyl-tetra(n-sulfophenyl)porphin. The photodamage to the lipids was determined from the accumulation of the products of their peroxidation. The photodamage to the proteins from the formation of crosslinks of the polypeptide membranes. The photodamage to the functional properties of the membrane was evaluated on the basis of the reduction of their permeability barrier, and by the inhibition of the transportation of glucose and pyruvate. Author

N86-19839# Joint Publications Research Service, Arlington, Va.
COVALENT CROSSLINKS BETWEEN FILAMENTS IN DNA INDUCED BY LASER Abstract Only
G. B. ZAVILGELSKIY, G. G. GURZADYAN, and D. N. NIKOGOSYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 58 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 568-570
Avail: NTIS HC A06

A study was made of the formation of covalent crosslinks and local denatured sectors in DNA under the influence of picosecond pulses of UV laser radiation. The kinetics of formation of these

defects were studied by a fluorescent method using acridine orange dye, which forms complexes with DNA. Radiation at 266 nm was used with a pulse repetition frequency of 0.3 Hz, pulse length 30 ps, intensity 10 to the 11th power to 10 to the 14th power W/sq m. The molecular weight of the phage C DNA used in the studies was about 4 X 10 to the 7th power daltons, diluted in the phosphate buffer pH 7.2 to a concentration of 15 micrograms/ml. The quantum yield of crosslinks is about 1.0 X .000001 over the entire range of intensities of -.1 to 10 to the 11th power W/sq m. At intensities of over 10 to the 11th power sq m. the quantum yield of crosslinks increases by an order of magnitude, to 1.0 X .00001 at 4.10 to the 13th power W/sq m. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-22996*# McGill Univ., Montreal (Quebec).
CANADIAN MEDICAL EXPERIMENTS ON SHUTTLE FLIGHT 41-G
D. G. D. WATT (McGill University, Montreal, Canada), K. E. MONEY, R. L. BONDAR, R. B. THIRSK, M. GARNEAU (National Research Council of Canada, Space Technology Program Office, Ottawa) et al. (CASI, Canadian Conference on Astronautics, 3rd, Ottawa, Canada, Apr. 23, 24, 1985) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 31, Sept. 1985, p. 215-226. Research supported by the Medical Research Council, National Research Council of Canada, Department of National Defence, and NASA. refs

During the 41-G mission, two payload specialist astronauts took part in six Canadian medical experiments designed to measure how the human nervous system adapts to weightlessness, and how this might contribute to space motion sickness. Similar tests conducted pre-flight provided base-line data, and post-flight experiments examined re-adaptation to the ground. No changes were detected in the vestibulo-ocular reflex during this 8-day mission. Pronounced proprioceptive illusions were experienced, especially immediately post-flight. Tactile acuity was normal in the fingers and toes, but the ability to judge limb position was degraded. Estimates of the locations of familiar targets were grossly distorted in the absence of vision. There were no differences in taste thresholds or olfaction. Despite pre-flight tests showing unusual susceptibility to motion sickness, the Canadian payload specialist turned out to be less susceptible than normal on-orbit. Re-adaptation to the normal gravity environment occurred within the first day after landing. Author

A86-23494
MEDICAL CONTROL OF THE AIRCREW DURING A RETRAINING PROCESS [MEDITSINSKOE OBESPECHENIE POLETOV V PROTSESSE PEREUCHIVANIIA LETCHIKOV]
V. I. ZORILE and V. N. IGNATKIN Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1985, p. 51-54. In Russian.

The process of retraining aircrews for operating new aircraft and combat equipment includes three stages: the preparatory, the learning, and the assimilation stages. Various elements of the preparatory and learning stages of retraining, including physical and psychophysiological criteria used in personnel selection, and the psychophysiological and physical preparatory regimens, are discussed. Special consideration is given to monitoring newly appearing preflight reactions (elevations in heart beat and respiration rates or body temperature), some of which might point to an oncoming disease or to nonadherence to the preflight regimen. The assimilation stage of the retraining process is characterized by steadily increasing rate in acquiring new sensorimotor habits, but this stage also requires continuous maintenance of the preflight and rest regimens. The length of periods between two flights is important: long (7-10 days) interruptions have a detrimental effect on the assimilation process. I.S.

A86-23495
METHODS OF REGULATING THE ADAPTATION AND RESISTANCE PROCESSES IN NAVY PERSONNEL [PUTI I SPOSOBY UPRAVLENIIA ADAPTATSIONNYM PROTSESSOM I REZISTENTNOST'IU ORGANIZMA MORIAKOV]
V. S. NOVIKOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Sept. 1985, p. 54-56. In Russian. refs

Three methods designed to raise the adaptability and resistance of an organism to stressful situations are described. The training method includes nonspecific and specific regimens. While the nonspecific regimen is designed to improve the subject's homeostasis by exercise, enhanced vitamin intakes and other means, the specific regimen consists in exposing the subject to gradually increasing doses of stress situations analogous to the ones that he is trained for. The pharmacological method involves drug-induced changes in the central nervous system, raising the resistance thresholds to particular stressors. Finally, the psychological method is aimed at training the will-power, increasing motivation level, and developing the sense of meaningfulness of the stress-producing activity. I.S.

A86-23502* Management and Technical Services Co., Houston, Tex.
HUMAN PHYSIOLOGICAL ADAPTATION TO EXTENDED SPACE FLIGHT AND ITS IMPLICATIONS FOR SPACE STATION
F. A. KUTYNA (GE Management and Technical Services Co., Houston, TX) and W. H. SHUMATE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 8 p. refs
(Contract NAS9-17133)
(SAE PAPER 851311)

Current work evaluating short-term space flight physiological data on the homeostatic changes due to weightlessness is presented as a means of anticipating Space Station long-term effects. An integrated systems analysis of current data shows a vestibulo-sensory adaptation within days; a loss of body mass, fluids, and electrolytes, stabilizing in a month; and a loss in red cell mass over a month. But bone demineralization which did not level off is seen as the biggest concern. Computer algorithms have been developed to simulate the human adaptation to weightlessness. So far these paradigms have been backed up by flight data and it is hoped that they will provide valuable information for future Space Station design. A series of explanatory schematics is attached. R.R.

A86-23503
HEALTH MAINTENANCE AND HUMAN PRODUCTIVITY IN THE SPACE STATION ERA
R. M. FARRELL AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 85-1312)

Health maintenance points for extended stays in space are presented, with emphasis on efectively and efficiently minimizing cardiovascular and musculoskeletal adaptations to weightlessness while maximizing the individual's productivity. Simulation of 1-g forces as provided by the Soviet 'penguin' constant-loading suit does not prevent the cardiovascular deconditining resulting from the shift of blood and lymph from the lower to the upper half of the body. Alleviation of such a shift of fluids is accomplished by the lower body negative pressure (LBNP) apparatus used for this purpose aboard Skylab. An ambulator LBNP suite is being developed to enable multiple use of the astronaut's time. Examples are given of devices for cardiovascular conditioning (the zero-g bicycle ergometer and the zero-g treadmill) and for larger muscle group conditioning (skiing and climbing simulators) for projected Space Station design. To minimize boredom as a negative psychological factor in conditioning, the development of zero-g

sports using existing equipment is envisioned. A comprehensive diagram on Space Station elements affecting productivity is included. R.R.

A86-23504* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PHYSIOLOGICAL CONSIDERATIONS FOR EVA IN THE SPACE STATION ERA
D. J. HORRIGAN, JR., J. M. WALIGORA, and D. S. NACHTWEY (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 7 p. refs
(SAE PAPER 851313)

The physiological parameters that will affect EMU design and operational scheduling for the Space Station Program are discussed. The system must be designed to safely and effectively handle the increased frequency of extravehicular activity projected for longer flight periods than in the past. In order to minimize the risk of decompression sickness a proper combination of equilibration time to cabin pressure, suit pressure, and prebreathing denitrogenation, is necessary. Effective thermal exchange is projected to be automatically controlled and to have an 8-hr 1000 BTU/hr capability. Physiological changes due to adaptation to weightlessness must be considered in scheduling for their impact on performance/fatigue and in coping with motion sickness. Radiation protection to the limit of 80 rad/quarter must be achieved by scheduling to avoid periodic proton and solar flare exposure, and by additional EMU shielding. Additional EMU considerations are the control of microorganisms and the higher pressure requirement for emergency O2 purge. R.R.

A86-23525
TISSUE GAS BUBBLE DYNAMICS DURING HYPOBARIC EXPOSURES
M. GERNHARDT (Oceaneering International, Inc., Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p. refs
(SAE PAPER 851337)

A mathematical model has been developed which describes the growth of an extravascular gas bubble in hyper and hypobaric environments. The model accounts for diffusion of inert gas across the tissue/bubble interface, tissue elasticity, gas solubility and diffusivity, surface tension and a perfusion limited inert gas transport to the tissue. Using this model, the dynamics of bubble growth can be predicted over a wide range of complex hypobaric exposures including decompressions and recompressions. The model can also account for oxygen breathing and switching inert gases during the exposure phase. Author

A86-24135
MATHEMATICAL MODELS OF THE EFFECT OF GRAVITATION ON LUNG FUNCTIONS [MATEMATICHESKIE MODELI DEISTVIIA GRAVITATSII NA FUNKTSII LEGKIKH]
A. I. DIACHENKO and V. G. SHABELNIKOV Moscow, Izdatel'stvo Nauka (Problemy Kosmicheskoi Biologii. Volume 51), 1985, 280 p. In Russian. refs

Theoretical conceptions and experimental data underlying the mathematical description of human lung functions are systematically described. Detailed attention is given to the derivation of equations of lung gas exchange, respiratory biomechanics, gas mixing in the respiratory pathways, the distribution of inhaled air, and blood flow between lung sections. The mathematical models obtained are used to analyze the effect of changes in gravity, posture, and other dynamic factors on ventilation, blood circulation, and gas exchange. Particular emphasis is placed on the regional irregularity and dynamics of the lung function. B.J.

A86-24307
NEURONS AS DETECTORS OF ERRORS IN THE SUBCORTICAL STRUCTURES OF THE HUMAN BRAIN [NEIRONY-DETEKTORY OSHIBOK V PODKORKOVYKH STRUKTURAKH MOZGA CHELOVEKA]
N. P. BEKHTEREVA, IU. D. KROPOTOV, and V. A. PONOMAREV (Nauchno-Issledovatel'skii Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 285, no. 5, 1985, p. 1233-1235. In Russian. refs

An experimental study has demonstrated that neurons of the human brain can react selectively to changes in discharge frequency when a task is performed erroneously. The error-detection capability is possessed by neurons of the pale globe and the ventrolateral nucleus of the visual tuber, structures that participate both in the processing of sensory information and in the provision of speech motor activity. B.J.

A86-24442
ABSORPTION OF MILLIMETER WAVES BY HUMAN BEINGS AND ITS BIOLOGICAL IMPLICATIONS
O. P. GANDHI and A. RIAZI (Utah, University, Salt Lake City) IEEE Transactions on Microwave Theory and Techniques (ISSN 0018-9480), vol. MTT-34, Feb. 1986, p. 228-235. USAF-supported research. refs

Aspects of the biological implications of millimeter wave radiation for human beings are discussed. The power densities likely to be encountered close to radiators in the 30-300 GHz frequency band are examined. The millimeter wave absorption efficiency of the human body with and without clothing is described, and the possibility of 90-95 percent coupling efficiency with clothing acting as an impedance matching transformer is addressed. The possibility of very high rates of energy deposition in the skin due to submillimeter depths of penetration is considered. The potential effect of millimeter wave absorption on human eyes, with particular emphasis on the cornea, in which high rates of energy deposition are encountered, are discussed. Hearing sensations produced by millimeter waves and thermal sensations by millimeter wave irradiation are addressed. C.D.

A86-24501
CLINICAL AND PSYCHOLOGICAL SURVEILLANCE OF STUDENT PILOTS AT THE BEGINNING OF TRAINING [LA SURVEILLANCE CLINIQUE ET PSYCHOLOGIQUE DES ELEVES-PILOTES EN ECOLE DE DEBUT]
G. DESMARIS (Armee de l'Air, Base Aerienne 709, France) and J. PLESANT (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 207-212. In French.

The physical and psychological observations which flight surgeons must make of students at the schools for military pilots during training are outlined. The students, in addition to classroom instruction, ground training and flight training, are evaluated for aptitudes for the various branches of the French Air Force in which they will serve, whether helicopter, transport of fighter aircraft duty. The motivation level of each student is assessed, and the flight surgeons must monitor the psychological evolution of the students as they go through flight training, especially in high performance jets. The majority of students who wash out do so in the early days, either voluntarily, because of medical reasons or because they do not display the skills or appreciation of flight safety required. The latter is of particular importance during formation flying. Some of the students are temporarily suspended if they have colds which affect their Eustachian tubes, a condition which calls for automatic grounding. A particular responsibility that the flight surgeon has is to recommend temporary grounding to offset fatigue, although the student may be apprehensive of interrupting a scheduled flight test. M.S.K.

A86-24502
CLINICAL PROBLEMS ENCOUNTERED BY A SQUADRON FLIGHT SURGEON [PROBLEMES CLINIQUES POSES PAR LA MEDECINE D'ESCADRE DE CHASSE]
O. MONTAUT (Armee de l'Air, Base Aerienne 112, Reims, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 212-214. In French.

The primary mission of a flight surgeon is to recognize clinical symptoms which, when exhibited by pilots, may compromise flight safety. Symptoms are more readily observed if the doctor increases the number of person-to-person contacts with pilots outside of the infirmary. It is the doctor who may be able to note certain symptoms which can lead to treatment which will permit a pilot to keep flying. A case study is noted wherein a pilot who crashed over Chad walked out of the desert. Later, he became subject to anxiety attacks so intense while flying that only an intense effort of the will would allow him to retain control of his hands. A period of several months rest, with some medications, was sufficient to allow a return to flight duty. A further service during Operation Manta is described, wherein the doctor provided extensive lessons to pilots regarding the avoidance of numerous tropical diseases, any of which could have rendered them unfit for flight duty. In any case, the doctor can formulate and articulate a course of action which will be acceptable to the pilot and to the commandant. M.S.K.

A86-24503
CLINICAL PROBLEMS POSED BY THE MEDICAL SURVEILLANCE OF PILOTS EXPOSED TO HIGH LEVELS OF ACCELERATION [PROBLEMES CLINIQUES POSES PAR LA SURVEILLANCE MEDICALE DES PILOTES SOUMIS ADES ACCELERATIONS ELEVEES]
(Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 215-220. In French.

The speed and maneuverability of modern jet fighters exposes pilots to g-forces which exceed the envelope of human endurance. The accelerations occur in linear, radial, angular and combined forms. Their effects are progressive as acceleration increases, moving from heaviness of the limbs and head to grey vision, to loss of vision, and finally to loss of consciousness. The debilities are accompanied by tachycardia, ECG anomalies and modification of the breathing rate. Beyond 5.5 g's the heart cannot pump sufficient blood to the brain, leading to unconsciousness if the acceleration lasts long enough. Anti-g suits that exert pressure on the lower extremities somewhat ameliorate the problem by forcing blood to the brain. However, fighters such as the Mirage can withstand 9 g turning loads in maneuvers, e.g., to avoid IR-seeking air-to-air missiles. As has been found with the F-16 pilots, high-g maneuvers can physically harm the pilot through hyperextension of the neck. The flight surgeon's role is to assist in developing new anti-g protection methods and to monitor pilot health, particularly to ensure that fatigue effects do not exacerbate the dangers of high-g flying. Teaching the M1, M2 and L1 maneuvers is also beneficial, especially if a centrifuge is available so that each pilot can determine which techniques are effective and perfect their implementation. M.S.K.

A86-24504
OPHTHALMOLOGICAL PROBLEMS LINKED TO HELICOPTER FLIGHT [PROBLEMES OPHTALMOLOGIQUES LIES AU VOL SUR HELICOPTERE]
Y. RODALLEC (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 221-225. In French. refs

Military helicopter pilots flying low-level missions encounter dangers from obstacles and power lines, along with visual hallucinations due to fatigue or myopia. Corrective lenses can ameliorate the myopia in daylight, but pilots selected for night flight should not be subject to the refractive problems caused by myopia. The vibrational environment of helicopter flight causes lesions in the retinae of pilots. Also, the diet of helicopter pilots in training is usually nutritionally deficient and meals are eaten hurriedly to meet schedules, occasionally leading to hypertension and/or diabetes, both of which can cause degenerative ocular lesions and myopia. It is necessary, therefore, to throughly examine pilot candidates to detect those who will not be fit for flight duty in the future. Some drugs enhance the production of visual purple and retard vision fading, and wearing red glasses aids in night vision adaptation. Protective lenses can also shield against the vision loss from bright lights and explosions, although layered lenses can also multiply the number of photons which reach the eye to enhance night vision. It may be better for the pilot to watch the desired scenes on a CRT. Wearing an apparatus which transmits IR images increases night vision, provided that sufficient training is given to correctly perceive relief. Several vision-enhancing techniques which may be used in the future are discussed. M.S.K.

A86-24505
A NEW TEST OF THE COLOR VISION OF PROFESSIONALS [UN NOUVEAU TEST DE CAPACITE CHROMATIQUE PROFESSIONNELLE]
P. J. MANENT, M. MAILLE, and J. C. BALLION (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 225-228. In French.

Military technical personnel, whether pilots, mariners or technicians must have a minimal amount of color vision for discerning, e.g., among the images on a display screen or among color-coded wires. The two standard tests used for French military personnel do not last sufficiently long and are not thorough enough to determine if candidate personnel possess the capacities for distinguishing among the colors which are germane to the professions for which they are training. A new test is described which satisfies the requirement. Standard military Telecom 112 PVC pairs cable contains 10 differently-colored wires wrapped in black PVC protection. Technician candidates with partial color blindness are required to identify the colored wires twice in random order. The technique was tested using subjects known to have five different types of red-green color blindness. The examiner observed closely to determine if the subjects hesitated at all in identifying individual colors. The test proved an effective means for determining if the candidates were capable of specific types of work, thus allowing some candidates to proceed on to the training of their choice. M.S.K.

A86-24506
RECURRENT SERIOUS OTITIS IN A RECONNAISSANCE PILOT - THE CONSEQUENCES FOR HIS CAREER [OTITE SEREUSE RECIDIVANTE CHEZ UN PILOTE TE RECONNAISSANCE CONSEQUENCES SUR LA CARRIERE DE L'INTERESSE]
J. H. BLONS (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 231, 232. In French.

A86-24507
A COLD THYROID NODULE - STATISTICAL DATA AND AERONAUTICAL APTITUDE [LE NODULE FROID ISOLE DU CORPS THYROIDE - DONNEES STATISTIQUES ET APTITUDE AERONAUTIQUE]
H. LIENHART, F. P. DOUCET, J. P. E. COHAT, M. P. ILLE (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France), J. F. GOUTEYRON (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) et al. (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 233-237. In French. refs

Statistical data are given for the diagnosis and prognosis of 110 sole cold thyroid nodules removed surgically from the necks of 140 military and civilian pilots. The nodules were discovered

over a period of 6 years by neck examinations of the pilots during routine physical examinations. Subsequent identification of the condition was done through thyroid scintography. Of the 110 nodules removed, 3 (2.72 percent) proved cancerous. The detection of the nodules removes the pilots from flight duty. After successful surgery, the pilots return to restricted duty until no evidence of cancer is found in return visits, at which time they return to full flight fitness. If cancer is found, then the pilots cannot fly until the condition is found to not return after repeated visits. M.S.K.

A86-24509
GASTRIC AND DUODENAL ULCERS AND THE FLIGHT FITNESS OF PILOTS [LA MALADIE ULCEREUSE GASTRO-DUODENALE ET L'APTITUDE DANS LE PERSONNEL NAVIGANT]
J. P. BURLATON, J. P. GOURBAT, N. GUERMAZI, G. LEGUAY, and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 239-243. In French. refs

The medical view of the effects of gastric and duodenal ulcers (GDU) on the flight fitness of pilots is discussed. Statistical studies have shown that the frequency of occurrence in pilots is equivalent to that of the general population. Only two cases of GDU have led to a medically ordered removal from flight duty in the past 24 years in France. For civilian pilots applying for a license, a year must have elapsed since reporting any symptoms from a GDU. Military pilots cannot fly with a GDU condition or detection of any precursor conditions of a GDU. However, it is noted that military pilots often return to flight duty before a year has passed with no symptoms of GDU. The normal sequence of treatment of ulcers and reexaminations to ensure that healing is progressing is traced, noting that it is often a psychologist's judgment that determines when a patient is cured because it is anxiety which is most responsible for the onset and continuance of GDU. Pharmacological approaches to treating GDU are described, along with surgical intervention to close the lesions accompanying the disease.
M.S.K.

A86-24510
MITRAL VALVE PROLAPSE IN A YOUNG PERSON - AN ESTIMATION OF THE RISK OF ARRHYTHMIA - THE IMPACT ON THE FLIGHT FITNESS OF A PILOT [LE PROLAPSUS VALVULAIRE MITRAL DU SUJET JEUNE - ESTIMATION DU RISQUE DE TROUBLE RYTHMIQUE - INCIDENCE SUR L'APTITUDE DU PERSONNEL NAVIGANT]
J. P. GOURBAT, J. P. BURLATON, N. GUERMAZI, G. LEGUAY, and A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 244-246. In French. refs

A86-24511
ISCHEMIC CARDIOPATHOLOGY IN PILOTS - THE RISK, THE METHODS OF DETECTION AND PREVENTION [CARDIOPATHIES ISCHEMIQUES ET PERSONNEL NAVIGANT - RISQUE, MOYENS DE DEPISTAGE ET DE PREVENTION]
A. G. DIDIER, H. P. ILLE, N. D. ALLEGRINI, C. M. MAUREL, and C. M. THOMAS (Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 246-250. In French. refs

Cardiac ischemia is a principal cause of death in humans over 40 years of age and a principal reason for removing pilots from flight duty. The rate of ocurrence among French military pilots over the period 1982-84 was 4.3/1000, less than the rate of occurrence in the general population. The main symptoms are anginal pain, infarctions and death. A 2 year study done of 1080 military pilots over 39 years old covered such factors such as smoking, systolic arterial pressure, cholesterol level and the severity of diabetes. The study was performed to identify, if possible, the risk of ischemia relative to the conditions monitored. A numerical model derived from the data showed that the risk of ischemia is related to the magnitudes of each of the assumed predisposing conditions. The data, when compared to the population of pilots studied, indicates that 5 percent of the population was a risk of an ischemic attack in the following year. However, the duration of the study is not considered sufficient to make truly quantitative predictions. M.S.K.

A86-24512
MECHANICAL SOLID VIBRATIONS [LES VIBRATIONS MECANIQUES SOLIDIENNES]
J. POIRIER (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 255-263. In French. refs

The physics of mechanical vibrations and their effects on the human body are discussed. There are four types of vibrations: sinusoidal, periodic, random and transitory. They are described terms of frequency, amplitude, displacement, acceleration and variations. In a vehicle, vibrations impart longitudinal, transversal and lateral accelerations to the human body, which can be considered as three primitive masses in a mass-spring system: the head, thorax and the lower extremities. Each primitive mass has a separate resonance frequency, as does the heart (4-8 Hz). The perception of vibration is dependent on numerous factors, and the speed and amplitude of vibrations determine whether or not and where, given individual variations, damage may be done to the human exposed to the vibrations. Various symptoms and debilities that can be caused by vibrations are identified and discussed, along with treatments to either cure or ameliorate the physical effects. M.S.K.

A86-25653
PROTEINURIA IN FIGHTER PILOTS AFTER HIGH +GZ EXPOSURE
H. NODDELAND, K. MYHRE, H. T. ANDERSEN (Institute of Aviation Medicine, Oslo, Norway), and U. I. BALLDIN (Karolinska Institutet; Forvarets Forskningsanstalt, Stockholm, Sweden) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 122-125. refs

Exposure to high gravitational forces acting along the body axis towards the feet (+Gz) causes considerable strain on several organ systems, including the kidneys. During +Gz tolerance studies without anti-G suits, significant amounts of protein and hyaline casts were found in 17 of 20 fighter pilots after centrifugation. The G load alternated between 3.5 and 5.5 G. Mean time in the centrifuge was 15 min. For comparison another group of 19 fighter pilots is examined after air combat maneuver training with anti-G suits. None showed proteinuria. The proteinuria most likely indicates a severely depressed renal blood flow during centrifugation.
Author

A86-25656* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AROUSAL AND STABILITY - THE EFFECTS OF FIVE NEW SYMPATHOMIMETIC DRUGS SUGGEST A NEW PRINCIPLE FOR THE PREVENTION OF SPACE MOTION SICKNESS
R. L. KOHL (NASA, Johnson Space Center; Universities Space Research Association, Houston, TX), D. S. CALKINS (NASA, Johnson Space Center; Technology Inc., Houston, TX), and A. J. MANDELL (California, University, La Jolla) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 137-143. refs

Sympathomimetic agents are frequent components in antimotion-sickness drug combinations because of their usefulness in counteracting the sedation caused by stressful motion or resulting from the administration of other antimotion-sickness drugs. The noradrenergic neurochemistry of the brain's arousal-attentional systems prompted us to evaluate the efficacy of five new sympathomimetic drugs and to further define the role of arousal in susceptibility to motion. Subjects were orally administered methamphetamine (20 mg), phenmetrazine (25 mg), phentermine

(37.5 mg), methylphenidate (20 mg), or pemoline (75 mg) 2 h prior to taking a Staircase Profile Test. All of the drugs increased resistance to stressful coriolis stimulation by 80-120 percent. Methylphenidate and pemoline showed fewer side effects. These findings, interpreted in conjunction with the documented inefficacy of most anticholinergic and antihistaminergic drugs tested to date, suggest that sympathomimetic drugs or a generalized state of arousal can inhibit the development of motion sickness. Author

A86-25658
ON THE USE OF A BUBBLE FORMATION MODEL TO CALCULATE DIVING TABLES
D. E. YOUNT and D. C. HOFFMAN (Hawaii, University, Honolulu) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 149-156. Research sponsored by the University of Hawaii. refs
(Contract NOAA-NA-81AAD00070)

The development of a set of air diving tables from a varying-permeability model (VPM) is examined. The computational algorithm and nucleation parameters for the calculation of the diving tables are described. The computed values are compared with tables from the US and British Navies; decompression profiles, no-stop thresholds, saturation dives, and total ascent times are evaluated. It is observed that the current diving tables show irregularities; however, the tables developed with the VPM are self-consistent, and are accurately interpolated and extrapolated. I.F.

A86-25661
ORTHOSTATIC TOLERANCE OF NORMAL INDIANS AND THOSE WITH SUSPECTED ABNORMAL CARDIOVASCULAR REFLEX STATUS
M. B. DIKSHIT, P. K. BANERJEE, and P. L. N. RAO (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 168-173. refs

There were 143 healthy Indian males subjected to 70 deg head-up tilt for 20 min on 166 occasions to evaluate their cardiovascular response. They responded with a significant rise in heart rate, diastolic pressure, and mean arterial pressure. Pulse pressure fell significantly. Heart rate and diastolic pressure during the tilt were significantly (p less than 0.05) and positively correlated to the height of the subjects. None of the subjects had syncope, which has been reported in normal individuals elsewhere. Of the 57 subjects with suspected abnormality of the cardiovascular reflex status, who were also investigated by the tilt test, 13 (22.8 percent) developed various degrees of orthostatic intolerance. Of these 13 subjects, 10 had had syncope in the past. In view of these observations, it is concluded that 70 deg head-up tilt is an important clinicophysiological investigation in the assessment of subjects with a suspected abnormality of their cardiovascular reflex status. Author

A86-25662
ANABOLIC STEROIDS AS A COUNTERMEASURE AGAINST BONE DEMINERALIZATION DURING SPACE FLIGHT
P. C. STEPANIAK, J. J. FURST, and D. WOODARD (Wright State University, Dayton, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 174-178. refs

The bone mineral content, hormonal, and histological changes which were observed on Apollo, Skylab, and Salyut/Soyuz flights, and in-laboratory experiments are described. The uses of dietary modifications, exercise programs, and pharmacologic preparations to stabilize bones and prevent the mobilization of Ca, in order to facilitate long term space habitation, are discussed. The influences of anabolic steroids on the retention of N, Ca, and P are analyzed; the negative effects of anabolic drugs are studied. I.F.

A86-26026
VISUAL DISTORTION - THE CORRELATION MODEL
R. S. KENNEDY (Essex Corp., Orlando, FL), K. S. BERBAUM (Iowa, University, Iowa City), and L. H. FRANK (Virginia Polytechnic Institute and State University, Blacksburg) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 189-194. refs
(SAE PAPER 841595)

The perceptual conflict theory states that any stimulus which causes a decorrelation of sensory channels initiates the firing of the chemoreceptor trigger zone, causing the appearance of motion sickness symptoms. A correlation version of the cue conflict theory is presented, together with the working assumptions with respect to perception conflict and the principles involved in the adaptation process. The elements of conflict, salience, and adaptation are discussed in the framework of the correlation model. The model is then applied to the phenomenon of visual distortion. Finally, a neural correlation process is suggested, in which the cerebellum acts as an executor and coordinator of the neurons involved in the correlation process. I.S.

N86-18960* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 279)
Jan. 1986 69 p
(NASA-SP-7011(279); NAS 1.20:7011(279)) Avail: NTIS HC $8.00 CSCL 06E

This bibliography lists 175 reports, articles, and other documents introduced into the NASA scientific and technical information system in December 1985. Author

N86-18961# School of Aerospace Medicine, Brooks AFB, Tex.
NIGHT VISION MANUAL FOR THE FLIGHT SURGEON Special Report, Mar. 1984 - Aug. 1985
T. J. TREDICI and R. E. MILLER, II Aug. 1985 45 p
(Contract AF PROJ. 775-5)
(AD-A159720; USAFSAM-SR-85-3) Avail: NTIS HC A03/MF A01 CSCL 17H

The Ophthalmology Branch, at the USAF School of Aerospace Medicine, has initiated a program to extensively study night visual performance. Some of the objectives of this program are to develop a simple, rapid, and accurate night vision screening device; establish norms for flying personnel; evaluate training and enhancement techniques; determine the effects of various nutrients and drugs; and investigate image-intensifying devices--i.e., night vision goggles (NVG). An additional objective is to update the educational level of USAF flight surgeons, base optometrists, and ophthamologists about the aeromedical aspects of night vision and the new NVG technology. This manual was designed to provide useful information to the medical personnels that provide direct support to operational units. GRA

N86-18962# Oak Ridge National Lab., Tenn. Biology Div.
CHEMICAL CHARACTERIZATION AND TOXICOLOGIC EVALUATION OF AIRBORNE MIXTURES: TUMORIGENICITY STUDIES OF DIESEL FUEL-2, RED SMOKE DYE AND VIOLET SMOKE DYES IN THE SENCAR MOUSE SKIN TUMORIGENESIS BIOASSAY SYSTEM Final Technical Report, 1982 - 1983
T. J. SLAGA, L. L. TRIPLETT, and R. J. M. FRY Sep. 1985 29 p
(Contract DE-AC05-84OR21400; DA PROJ. 3E1-61102-BS-04)
(AD-A159728; ORNL/TM-9752) Avail: NTIS HC A03/MF A01 CSCL 06T

The tumorigencities of Diesel Fuel-2, Red Smoke Dye and Violet Smoke Dye were tested in the SENCAR Mouse Skin Bioassay System. The Diesel Fuel-2 gave a significant tumor response when tested as a tumor promoter but negative results when tested as a complete carcinogen. There were no tumor responses to either the Red or Violet Smoke Dyes when tested as complete carcinogens. Although a few tumors occurred in the Red and

Violet Smoke Dye tumor initiation studies, the response was not significantly different from that of the controls. GRA

N86-18963# Retina Foundation, Boston, Mass. Eye Research Inst.
EYE MOVEMENTS AND SPATIAL PATTERN VISION Annual Report, 1 Feb. 1984 - 31 Jan. 1985
L. E. AREND 28 Feb. 1985 25 p
(Contract F49620-83-C-0052)
(AD-A160408; AFOSR-85-0741TR) Avail: NTIS HC A02/MF A01 CSCL 06P

Low contrast, low spatial frequency luminance sawtooth patterns look like luminance staircases, with no brightness changes over the shallower luminance slope. Brightness measurements at corresponding points in different cycles of these patterns showed substantial illusory brightness differences. Other measurements showed that the illusion is not confined to strictly subthreshold luminance gradients, but occur with slightly suprathreshold gradients as well. In models which attempt to explain these illusions the visual system integrates over the thresholded gradient of the stimulus distribution. The integration encounters problems due to curl introduced by the nonlinear threshold operator. Brightness measurements indicated that these problems have a visual counterpart, further support for the models. Several new illusions were found to result from this nonlinear threshold for spatial gradient. Inconsistencies in the spatial integrals performed by the visual system result in multistable brightness perceptions for some patterns. GRA

N86-18964# Human Engineering Labs., Aberdeen Proving Ground, Md.
PRACTICAL APPLICATION OF BASIC RESEARCH ON IMPULSE NOISE HAZARD Final Report
G. R. PRICE Jan. 1985 12 p
(AD-A160432; HEL-TM-1-85) Avail: NTIS HC A02/MF A01 CSCL 06S

To assess impulse noise hazard accurately, procedures should be based on the physiological mechanisms underlying hearing loss. Information from basic research studies is relevant in three areas. First, there is a spectrally dependent critical level above which loss mechanisms change from amode that is probably metabolically based to one that is mechanically based. Stimulation at and above this second mode should be avoided. Second, in spite of the regulatory trend ignoring the time pattern of stimulation, studies continue to indicate at that intermittency ameliorates the effect of noise, producing less effect for a given amount of energy in the exposure. Lastly, a variety of sources can be interpreted as indicating that meters designed to rate hazard should have: a rise-time capability in the vicinity of 20 microseconds; a dynamic range of over 100 dB; and employ a frequency weighting function such as A-weighting, although the shape is not critical due to the relatively sharp tuning of the ear and the generally flat noise spectra commonly encountered in the work place. GRA

N86-18965# Army Research Inst. of Environmental Medicine, Natick, Mass.
PREDICTION MODELING OF PHYSIOLOGICAL RESPONSES AND HUMAN PERFORMANCE IN THE HEAT
K. B. PANDOLF, L. A. STROSCHEIN, L. L. DROLET, R. R. GONZALEZ, and M. N. SAWKA Sep. 1985 29 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A160513; USARIEM-M-1/86) Avail: NTIS HC A03/MF A01 CSCL 06S

Over the last two decades, the Military Ergonomics Division of the US Army Research Institute of Environmental Medicine has been establishing the data base and developing a series of predictive equations for deep body temperature, heart rate and sweat loss responses of clothed soldiers performing physical work at various environmental extremes. This document describes the attempt to program these predictive equations on various desk top and hand held calculators with the express purpose of developing a comprehensive heat stress model for predicting soldier performance to work, clothing and the environment. This model deals with the interaction of various multi-disciplinary factors such as: (1) the theoretical physics of heat transfer, (2) the biophysics of clothing, (3) the physiology of metabolic heat production, distribution and elimination, and (4) related meteorological considerations. The primary physiological inputs are deep body (rectal) temperature and sweat loss while the predicted outputs are the expected physical work-rest cycle, the maximum single physical work time if appropriate, and the associated water requirements. This document presents the mathematical basis employed in the development of the various individual predictive equations of our heat stress model. In addition, our current heat stress prediction model as programmed on the HP 41 CV is discussed from the standpoint of proprietary in meeting the Army's needs and therefore assisting in military mission accomplishment. GRA

N86-18966# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
THE BEGINNINGS OF AIRBORNE WEIGHTLESSNESS RESEARCH Final Report
H. J. VONBECKH Jan. 1985 67 p
(AD-A160575; NADC-85016-60) Avail: NTIS HC A04/MF A01 CSCL 06S

After World War II an increasing number of aeromedical investigators became interested in the medical problems of space flight, particularly its most challenging aspect: weightlessness. Until 1950 their efforts remained limited to theoretical deliberations and predictions. Beginning in the early fifties, however, researchers began actively to experiment with weightlessness aboard aircraft in vertical diving flights and later by flying Keplerian parabolic trajectories. H.J. von Beckh made the first weightlessness experiments in aircraft with humans and test animals (water turtles) which were published at the 4th International Astronautical Congress in Zurich and in the Journal of Aviation Medicine. Von Beckh's experiments showed that the subjects during weightlessness had by no means a strong fall reflex, as predicted by Haber and Gerathewohl in their theoretical paper, in which they evoked the Weber-Fechner Law. The disorientation and lack of neuromuscular coordination occurs only in the first seconds of weightlessness. Later, the control of the vision sense makes aiming movement possible. The incidence of motion sickness was moderate in the weightlessness flights with the Fighter aircraft Fiat G55 and the F 94 C, because the subjects were tied down in the seat and avoided head movements. Later, in the flights with the cargo aircraft C 131, the incidence was considerably higher, because the subjects could move freely and were even allowed to make somersaults, In a later paper (1959) von Beckh showed that weightlessness decreases the acceleration tolerance. This was reconfirmed many years later when the astronauts suffered orthostatic hypotension after their return to the Earth. GRA

N86-18967# Army Research Inst. of Environmental Medicine, Natick, Mass.
FACTORS WHICH ALTER HUMAN PHYSIOLOGICAL RESPONSES DURING EXERCISE-HEAT ACCLIMATION
K. B. PANDOLF, M. N. SAWKA, and Y. SHAPIRO Sep. 1985 22 p
(AD-A160580; USARIEM-M-41/85) Avail: NTIS HC A02/MF A01 CSCL 06N

Researchers generally agree that high aerobic fitness achieved through physical training will reduce the physiological strain to exercise in the heat, but does not replace the benefits of an exercise-heat acclimation program. In addition, high aerobic fitness is hypothesized as a major factor in the small decay and rapid re-acclimation of individuals after they ceased exercising in hot environments. However, recent work from our laboratory suggests that improved aerobic fitness by physical training must be associated with significant elevations in core temperature during the training process in order to improve exercise-heat tolerance. Two recent studies comparing men and women with similar aerobic fitness indicate no major physiological differences between genders in both humid and dry heat for cardiovascular and thermoregulatory responses to these environments either before or after acclimation.

Our laboratory has reported that after exercise-heat acclimation under wet conditions (mild or hot), females tolerate the heat in a more efficient fashion than males while under hot-dry conditions males seem to be at some physiological advantage. Even fewer studies are reported which evaluate physiological differences in heat tolerance to exercise in relation to age. In general, exercise-heat tolerance is reduced in pre-pubertal children (boys and girls) and older adults (men and women) compared to young men and women. However, aerobically fit older adults seem to have far fewer decrements in the performance of exercise in the heat than less fit older adults. GRA

N86-18968# Minnesota Univ., Minneapolis.
DNA AND PROTEIN STUDIES OF HLA CLASS 2 MOLECULES: THEIR RELATIONSHIP TO T CELL RECOGNITION
M. SEGALL, J. S. CAIRNS, C. A. DAHL, J. M. CURTSINGER, and S. FREEMAN 1985 29 p
(Contract N00014-85-K-0004; PHS-AM-31342)
(AD-A160704) Avail: NTIS HC A03/MF A01 CSCL 06A

The HLA-D region, encoding class 2 antigens, was first defined based on studies of mixed leukocyte culture (MLC) (Bain, et al. 1964; Bach and Hirschhorn, 1964). In our studies with colleagues (Amos and Bach, 1968; Bach et al., 1969), we were able to suggest that a genetic region encoding molecules that stimulate proliferation in MLC may be linked to, but separate from, the HLA-A and -B loci, i.e., a region such as HLA-D; definitive studies in this regard (Yunis and Amos, 1971) established the existence of the HLA-D region. Great advances have been made in our understanding of this region in recent years utilizing both the tools of molecular genetics and studies of proteins encoded by HLA-D genes. A critical bridge that has not yet been completed concerns the relationship of class II genes and protein products to determinants recognized by T lymphocytes, i.e., the cells responding in MLC. Although the emphasis in this review will be on studies of proteins and of DNA, an introduction to this article also includes our current state of knowledge regarding definition of class II products with T lymphocytes. The inclusion in this volume of several articles on the same topic allows a measure of comfort with such an approach. GRA

N86-18969# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
GLUCOCORTICOID ANTAGONISM BY ENDOTOXIN: BIOLOGICAL EFFECTS DURING STRESS AND BASIS FOR INHIBITION OF PHOSPHOENOLPYRUVATE CARBOXYKINASE M.S. Thesis
W. B. HUFF Aug. 1985 133 p
(AD-A160740; AFIT/CI/NR-85-116T) Avail: NTIS HC A07/MF A01 CSCL 06T

Bacterial endotoxins produce a variety of pathophysiologic effects by inducing the release of humoral factors from cells of the reticuloendothelial system, primarily macrophages. This study focusses on one particular factor, glucocorticoid antagonizing factor (GAF). Antagonism was augmented when mice were subjected to conditions of stress where adrenoglucocorticoids are necessary for survival. Mice were sensitized to both toxic endotoxin and irradiated detoxified endotoxin during the stress of cold, heat, and tourniquet shock. Endotoxin, as well as detoxified endotoxin, induced the release of GAF from cells of the RES, Treatment of mice with this GAF-rich serum also resulted in their sensitization to stress. Survival of LPS-poisoned animals subjected to stress could be improved when exogenous hydrocortisone was given prior to the administration of exogenous GAF-rich serum or prior to the release of endogenous GAF in response to endotoxin. Naloxone, a B-endorphin antagonist, failed to increase the survival rate of animals under the experimental conditions investigated. GRA

N86-18970# Army Research Inst. of Environmental Medicine, Natick, Mass.
PLATELET-ENDOTHELIAL FUNCTION IN RELATION TO ENVIRONMENTAL TEMPERATURE Final Report, 1 May 1982 - 1 Mar. 1984
S. P. BRUTTIG, G. D. DRAPER, and M. P. HAMLET Mar. 1984 28 p
(Contract DA PROJ. 3E1-61101-BS-10)
(AD-A160744; USARIEM-T-6/84) Avail: NTIS HC A03/MF A01 CSCL 06E

Thromboembolic phenomena are commonly observed in frostbite injury to the microvasculature. Large blood vessel endothelium was used to assess any alterations in platelet-endothelial interaction resulting from low environmental temperatures. Media from bovine endothelial cells (37, 24, 4C) did not cause or enhance platelet aggregation. Yet ADP (120 micrometers) stimulated aggregation of all platelet samples. Bovine and porcine endothelial cells were incubated at 37, 24, 4, and 0.5 C with homologous platelets suspended in Tyrodes at 37, 24, 4, and 0.5 C with homologous platelets suspended in Tyrodes buffer plus albumin, and the rate of ADP-stimulated platelet aggregation was compared with control platelets. Bovine venous endothelial cells (at 37 C) inhibited platelet aggregation more strongly than aortic endothelial cells. This inhibition was blocked by aspirin (7 mM) and was independent of environmental temperature. Porcine endothelial cells also inhibited platelet aggregation. This inhibition (maximal at 37 C) was significantly attenuated by temperatures or = 24 C. A significant loss of inhibition of platelet aggregation could lower the threshold at which parenchymally-derived nucleotides or other substances from damaged cells can cause aggregation. Thus, in porcine endothelial cells bovine endothelial cells, a possible mechanism for the thromboembolic action of cold is suggested. Author (GRA)

N86-18971# New York Blood Center, N.Y.
THE PRODUCTION OF RHO(D) NEGATIVE ERYTHROCYTES Annual Report, 1 Jul. 1984 - 30 Jun. 1985
J. GOLDSTEIN 24 Jun. 1985 8 p
(Contract N00014-84-C-0543)
(AD-A160775; AD-E401375) Avail: NTIS HC A02/MF A01 CSCL 06A

Attempts are being made to modify or destroy the Rh (D) antigen under conditions which will produce Rh negative erythrocytes of transfusable quality. To this end the effects of various lipase and membrane perturbants are being examined. Isolation and biochemical characterization of the D antigen is also being undertaken in order to gather information which will help formulate ways of modifying its expression. GRA

N86-18972# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL TRIAL TO TEST THE EFFICACY OF TEMAZEPAM TO INDUCE SLEEP AND IMPROVE SUBSEQUENT PERFORMANCE DURING PARTIAL SLEEP DEPRIVATION AND CIRCADIAN RHYTHM DESYNCHRONOSIS M.S. Thesis
J. E. MCGHEE Jun. 1985 58 p
(AD-A160795; AFIT/CI/NR-85-126T) Avail: NTIS HC A04/MF A01 CSCL 06O

This thesis presents a strategy for reducing jet lag induced performance degradations by resetting rhythms during prolonged rapid transmeridian flight is studied. Thirty-four aircrew member passengers on a C-141 flight were given temazepam or placebo during the flight from Oklahoma to Saudi Arabia for induction of sleep in a period compatible with sleep cycle at the destination, but out-of-sync with previous patterns set at home station, Mental performance and circadian rhythm patterns were tested per-flight, inflight and post-flight by several measurements including a computerized performance battery. The results indicated that in the temazepam group performance was improved to near baseline levels. The restorative power of temazepam induced sleep during a period of partial sleep deprivation and temazepam's ability to reset circadian rhythms prior to arrival in the new time zone were demonstrated. GRA

N86-18973# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

A STUDY OF THE FLIGHT ENVIRONMENT COMPONENT OF AIRCREW FATIGUE IN STUDENT NAVIGATORS M.S. Thesis

D. R. DOUVILLE Jun. 1985 66 p

(AD-A160796; AFIT/CI/NR-85-128T) Avail: NTIS HC A04/MF A01 CSCL 06S

One approach to understanding the causes of aircrew fatigue is to devide them into: (1) those related to the unique demands of aircrew tasks or workload, and (2) those related to the unique environment of flight. The pilot not only has to navigate, make radio calls and negotiate instrument landings, but he must do it all in a noisy, vibrating, constantly moving environment. Most studies in aircrew fatigue focus on the workload part of the equation. The study described in this proposal is an attempt to define that part of aircrew fatigue which is due to the flight environment. It also attempts to determine changes in body chemistry produced by the flight environment which might be associated with aircrew fatigue. Navigator students in training at Mather Air Force Base, California fly training missions of similar duration and quality in T-43 aircraft and ground simulators. The difference in fatigue and body chemistries after flights in these two settings represent that which is due to the difference in environments. Using student navigators as subjects, blood samples would be taken before and after: (1) a five hour T-43 (Boeing 737) flight, and (2) a five hour ground simulator mission. Changes in a panel of 26 blood chemistries (including plasma osmolality and carboxyhemoglobin) for each setting would be compared for significant differences. Fatigue would be assessed in each setting using: (1) a subjective fatigue questionnaire, (2) hours of sleep following the mission, and (3) performance (academaic score). GRA

N86-18974# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

SOME NONOCCUPATIONAL ASPECTS OF SENSORINEURAL LOSS OF HEARING ACUITY: A PROPOSED DESIGN FOR STUDY M.S. Thesis

T. VARLEY Jun. 1985 42 p

(AD-A160799; AFIT/CI/NR 85-127T) Avail: NTIS HC A03/MF A01 CSCL 06S

Although the adverse effects of occupationally associated noise on hearing have been well documented, review of the recent literature revealed few studies which have carefully measured the role of nonoccupational loud sound in sensorineural hearing loss. This thesis will measure the strength of association of sensorineural deafness and avocational noise by calculating the odds ratio in a case-comparison design. The prevalence of avocational loud noise activities of a group of 200 cases diagnosed as having sensorineural deafness at retirement from the United States Air Force will be compared with the prevalence of avocational loud noise activities of a group of nondeaf Air Force retirees who have been matched for age, service occupation, family history of hearing loss, personal history of hearing loss and known causes of otic dysfunction. Limitations of the study and anticipated results are discussed. GRA

N86-18975# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

A PROPOSAL FOR A LONGITUDINAL STUDY TO ASSESS THE HAZARDS OF RADIATION IN SPACE FLIGHT M.S. Thesis

G. I. REEVES Jun. 1985 47 p

(AD-A160801; AFIT/CI/NR-85-125T) Avail: NTIS HC A03/MF A01 CSCL 06E

This thesis involves the establishment of a registry of all United States astronuats, past and future, plus nonastronaut controls. The registry will record the incidences of malignant neoplastic disease and diabetes mellitus, and the space radiation exposure received. Data will be carefully analyzed to see if there is a dose-related increase in these diseases related to the exposure to ionizing radiation, with an eventual goal of establishing reliable risk estimates related to dose received. The history of cancer related to radiation exposure is summarized, and the space radiation environment briefly described. Physiological changes accompanying space flight and their potential effects on radiation tolerance and carcinogenesis are discussed. The reasons why data from animal experiments and human occupational, medical, and nuclear weapon exposure cannot be extrapolated to the long term health risks of astronauts are discussed at length, and the study instruments for establishing a long term descriptive surveillance study are described. Author (GRA)

N86-18976# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

A MODEL OF INHALED GAS AND VAPOR TRANSPORT IN THE HUMAN LUNG Ph.D. Thesis

M. L. SHELLEY 1985 134 p

(AD-A160829; AFIT/CI/NR-85-143D) Avail: NTIS HC A07/MF A01 CSCL 06P

The transport of inhaled gas or vapor in the human lung is theoretically modeled to determine the fraction of inhaled gas or vapor absorbed through the bronchial walls in the conductive zone and the fraction entering alveolated space and undergoing blood/gas exchange. An iterative-analytical approach is used, rather than a numerical one, to generate a large amount of data over a wide range of gas or vapor solubilities and diffusivities. The model applies to gases or vapors of low solubility. Simple analytical expressions are fitted to model results, expressing fractional bronchial absorption and alveolar uptake in terms of gas or vapor solubility and diffusivity. Typical physiological parameters are assumed and only physical properties of the gas or vapor are required for input. Methods are presented which allow estimation of these input values. GRA

N86-18977# Naval Health Research Center, San Diego, Calif.

REVIEW OF DUODENAL AND GASTRIC ULCER Final Report

F. C. GARLAND and E. D. GORHAM Mar. 1985 23 p

(AD-A160919; NAVHLTHRSCHC-85-9) Avail: NTIS HC A02/MF A01 CSCL 06E

Duodenal and gastric ulcer are chronic often recurring conditions that in the past were grouped together as peptic ulcer. Many diverse environmental and genetic factors, which create an imbalance between secretion of acid and pepsin by the stomach and the resistance of the gastrointestinal mucosa may lead to the development of a duodenal or gastric ulcer. Incidence trends and risk factors for these two diseases are different. Reported mortality and hospitalization rates declined markedly for duodenal ulcer from 1970 to 1978, but remained relatively stable for gastric ulcer over the same time period. Recent changes in treatment and diagnosis may account for much of this decline. Several environmental factors associated with duodenal or gastric ulcer have been identified. The principal risk factor for duodenal ulcer is cigarette smoking. Less certain associations with diet, emotional stress, coffee consumption, and occupation have also been reported. Risk of gastric ulcer is also increased by cigarette smoking. Aspirin use, however, is the strongest reported rick factor for gastric ulcer. Uncertain associations between gastric ulcer and alcohol consumption have also been reported. Separate familiar aggregation of duodenal and gastric ulcer indicates that genetic mechanisms leading to the development of these diseases are also distinct. Inheritance patterns for hyperpepsinogenemia I, the Zollinger-Ellison syndrome and several other genetic conditions predisposing to the development of either duodenal or gastric ulcer have been described. GRA

N86-18978# Pennsylvania Univ., Philadelphia. Cerebrovascular Research Center.
DETERMINATION OF THE LUMPED CONSTANT AND THE KINETIC CONSTANTS FOR DEOXYGLUCOSE AND FLUORODEOXYGLUCOSE IN MAN
J. H. GREENBERG, M. REIVICH, A. ALAVI, A. WOLF, J. FOWLER, J. RUSSELL, C. ARNETT, R. R. MACGREGOR, C. Y. SHIUE, and H. ATKINS 1985 2 p Presented at the 12th International Symposium on Cerebral Blood Flow and Metabolism, Lund, Sweden, 16 Jun. 1985 Prepared in cooperation with Brookhaven National Lab., Upton, N.Y.
(Contract DE-AC02-76CH-00016)
(DE86-000317; BNL-36937; CONF-8506187-2) Avail: NTIS HC A02/MF A01

If both the time course of the arterial plasma radionuclide concentration and the brain tissue radionuclide concentrations are known, it is possible to calculate the kinetic constants (k1*, k2*, k3*, k4*) of the glucose analogue. In a series of male subjects, arterial blood samples were obtained at frequent intervals immediately following the bolus administration of F-18-FDG and then at less frequent intervals for up to 5 hours after the radionuclide administration. The tissue time course was obtained by making positron emission tomographic scans every three minutes for 30 minutes and then at less frequent intervals for 5 hours. These images were used to construct the time course of (18)F activity in gray and white matter structures. Using these values for the lumped constants and the kinetic constants, the values obtained for the global metabolic rate for glucose in two series of young male subjects were 4.99 + or - 0.23 and 5.55 + or - 0.37 mg/100 g/min when C-11-DG and F-18-FDG were used as tracers respectively. DOE

N86-18979# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany).
FIRST GERMAN SPACELAB MISSIONS, NO. 6 [ERSTE DEUTSCHE SPACELAB-MISSION]
Aug. 1985 9 p In GERMAN
Avail: NTIS HC A02/MF A01

The German Spacelab Mission D1 crew; D1 scientific investigations of weightlessness and microgravity effects on fluids, cell functions and development processes, and human body; navigation; crew training (simulation and flight program); and commercial spin-offs of space flights are discussed.
Author (ESA)

N86-19832# Joint Publications Research Service, Arlington, Va.
FLUORESCENT-POLARIZATION PROPERTIES OF CHROMOPHORES OF WATER-SOLUBLE PROTEINS OF NORMAL AND CATARACTAL HUMAN LENS
T. V. BIRICH, N. I. POZNYAK, N. A. PROKOSHINA, and S. N. CHERENKEVICH *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 21-24 2 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk BSSR (Minsk, USSR), v. 29, no. 8, Aug. 1985 p 757-759
Avail: NTIS HC A06

The fluorescent properties, including the lifetime of the excited state of the molecules and the degree of polarization of fluorescence of the water soluble proteins of the normal and cataractal human lens cortex and nucleus are studied. The water soluble fraction of the proteins of the lens cortex and nucleus obtained after homogenization in physiological solution and subsequent centrifuging at 6000 g for 20 min. was also studied. All the studies were done at room temperature. The spectral fluorescent properties including the fluorescence lifetime and polarization of water soluble cortex and nucleus proteins are found to be different in normal and cataractal human lenses. The origin of chromophores which are emitted in the visible spectral range and the modification of protein structure are associated with the formation of intra- and intermolecular covalent bonds in proteins.
Author

N86-19833# Joint Publications Research Service, Arlington, Va.
ELEMENT ANALYSIS OF SCLEROTIC FORMATIONS OF MAJOR BLOOD VESSELS BY LASER MASS SPECTROMETRY Abstract Only
G. G. ARABIDZE, S. M. BURKITBAYEV, Y. A. BYKOVSKIY, A. I. KUTSENKO, I. D. LAPTEV, E. A. MANYKIN, Y. A. PETRENKO, and V. T. TIMOSHIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 29 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 655-660
Avail: NTIS HC A06

The element and isotope composition as well as changes in natural propagation of isotopes of elements in sclerotic (plaque) formations developing on the walls of the blood vessels in atherosclerosis is studied by laser mass spectrometry. Sections of sclerotic arteries in various stages of development of atherosclerosis were studied. Before placement in the ion source chamber, the specimens were dewatered with 10% formalin solution and by exposure to various concentration of tartaric acid, then dried at 37 C and atmospheric pressure. Experiments showed that atherosclerotic plaque consists of 12 to 16 elements. The total content of isotopes of the macrocomponents was determined mathematically. Significant changes in the content of trace elements were observed in various stages of vascular damage, anomalous disorders in the natural distribution of isotopes of oxygen, silicon, magnesium and calcium were observed in various stages on the development of atherosclerosis. Author

N86-19834# Joint Publications Research Service, Arlington, Va.
CLINICO-EPIDEMIOLOGICAL CHARACTERISTICS OF Q FEVER IN CARPATHIAN FOOTHILLS
A. A. SUKHOPYATKINA, O. S. BAT, A. V. LEVITSKAYA, and V. G. POTAPOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 34-36 2 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, April 1985 p 80-81
Avail: NTIS HC A06

The polymorphism and relative lack of severity of the clinical course of Q fever, as well as the multiplicity of ways of its transmission, lead to a situation in which this disease can go unrecognized. In connection with this, deeper study of the characteristics of its epidemiology are making it possible to establish the presence of natural and anthropurgic foci of this infection. The epidemiological investigation of Q fever was begun in 1975 and have continued to study the infection of the population. In 1975 blood serum from 216 individuals was studied in a complement fixation test with Coxiella burnetii, with negative results. In 1976, 2.1 percent of those examined were found to have a complement-binding antibody to C. burnetti in titers of 1:10 to 1:80. It was established that in one of the rayons of the oblast there existed an active anthropurgic focus of Q fever, manifested by group illness of the personnel working on dairy farms. The source of the infection for people was cattle, and the main method of transmission of the infection was aerogenic. A higher rate of infection by Q fever was observed among workers in livestock raising farms and meat combines. Author

N86-19835# Joint Publications Research Service, Arlington, Va.
EPIDEMIOLOGICAL SUPERVISION OF POLIOMYELITIS
Y. I. VASERIN, L. V. VASERIN, R. G. VLASOVA, R. G. BALAKIREVA, S. F. ZAKIROVA, N. V. PATSUK, and N. Y. VENEDIKTOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 37-42 2 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 81-85
Avail: NTIS HC A06

The events of the last decade have shown that under conditions of mass vaccination various regions of our country record isolated cases and outbreaks of poliomyelitis. A thorough description has been made of a period of epidemic increase in the rate of poliomyelitis in Sverdlovsk in 1969 to 1972, when epidemiological,

virological, and serological methods were used to establish the polio virus etiology of most of the cases of paretic diseases. Some conclusions reached because of this monitoring are: (1) under conditions of mass vaccination, sporadic cases of poliomyelitis can be observed among inoculated children; (2) development of a program of epidemiological supervision of poliomyelitis for each administrative region has been proven necessary; and (3) epidemiological supervision of poliomyelitis should provide for early and complete discovery of all cases of the infection, regardless of the severity of the illness, analysis of the quality of vaccination, and determination of the immune status of the population of children and the characteristics of circulation of polio viruses. Author

N86-19837# Joint Publications Research Service, Arlington, Va.
INVESTIGATION OF REACTOGENIC AND ANTIGENIC ACTIVITY OF CHROMATOGRAPHICALLY PURIFIED, CONCENTRATED AND INACTIVATED DRY VACCINE AGAINST TICK BORNE ENCEPHALITIS Abstract Only
O. V. POPOV, A. A. SUMAROKOV, R. Y. SHKOLNIK, L. B. ELBERT, M. S. VOROBYEVA, G. L. KRUTYANSKAYA, A. V. RAZGULYAYEVA, and M. N. RASSHCHEPKINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 51-52 2 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 6, Jun. 1985 p 34-39
Avail: NTIS HC A06

It is shown that the new concentrated chromatographically-pure (CCP) vaccine against tick borne encephalitis (TBE) had moderate reactivity in doses of 0.5 and 1 ml. A direct relationship was established between the frequency and intensity of postvaccination reactions of the vaccinated individuals and the dose. The highest indices of reactivity in individuals treated with CCP vaccine were noted after the first vaccination. CCP vaccine has high antigenic activity: virus-neutralizing antibodies are found in twice vaccinated individuals in 97 to 100% and antigen agglutinations in 75 and 91% respectively. This vaccine should be used for primary vaccination against TBE using two 0.5 ml injections 6 months apart. Author

N86-19840# Joint Publications Research Service, Arlington, Va.
EXHIBITS CONCERNING SPARING MEDICINE AT ZDRAVOOKHRANENIYE-85 AT MOSCOW Abstract Only
Y. PONARINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 59-60 2 Jan. 1986 Transl. into ENGLISH from Sotsialisticheskaya Industriya (Moscow, USSR), 3 Aug. 1985 p 4
Avail: NTIS HC A06

Exhibits concerning sparing therapy, displayed in Moscow, are listed and described briefly. The Delta-102 relieves pain without use of other analgesics by preventing pain impulses from entering the brain and by inciting release of endorphin. Akma magnets are helpful in alleviating migraine, toothache, sciatica, insomnia and can be used to assist efforts to stop smoking. The patients themselves fasten the magnets to acupuncture points. The Ritm EKG device takes readings from 64 points rather than the usual six and the data obtained are processed and displayed automatically. The comprehensive, automatic, republic system for mass physical examinations Kasmon employs electronic devices to allow one physician and 10 nurses to examine 13,000 patients. The Kardiolayn device can be used to monitor physical parameters of patients after release by their physician. Other exhibits demonstrated surgical procedures employed to perform unique eye surgery procedures, the use of plasma jet scalpels and a method of kidney stone treatment by shock waves in which the patient is subjected to shock waves after precise location of the stone and immersion in water. Author

N86-19841# Joint Publications Research Service, Arlington, Va.
MAGNETS AND SURGICAL PROCEDURES
V. SARELYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 62-63 2 Jan. 1986 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 23 Aug. 1985 p 3
Avail: NTIS HC A06

The work of physicists, who are creating miniature magnets with great magnetic force, has permitted the widespread use of magnets in surgery. The development and introduction into clinical practice of new operations for diseases of the gastrointestinal tract and malformations of the thorax using original magnetic and mechanical systems is discussed. A multitude of different magnetic structures were specifically created for various operations. A new direction in surgery has been established. Some 5000 operations have been performed with very positive results. Author

N86-19843# Joint Publications Research Service, Arlington, Va.
THERMOVISUAL INDICATORS OF BRAIN RESPONSE TO VISUAL STIMULI Abstract Only
I. A. SHEVELEV, Y. N. TSYKALOV, A. M. GORBACH, K. P. BUDKO, and G. A. SHARAYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 75 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 538-543 Original language document was announced in IAA as A86-10695
Avail: NTIS HC A06

A noninvasive thermovisual method was used to detect thermal reaction in the occitoparietal area of human brain cortex to stimulation of the eye with light from a photostimulator. The temporal, spatial, and temperature characteristics of the thermal effect were obtained by use of the AGA-780 thermoviser connected to a computer system. Possible mechanisms of the interrelationship between the visual stimuli and the thermal reaction of the human brain are discussed. I.S.

N86-19844# Joint Publications Research Service, Arlington, Va.
NEURONAL RESPONSE AND EVOKED POTENTIALS IN SUBCORTICAL FORMATIONS IN VISUAL PERCEPTION. PART 1: PROBLEM FORMULATION AND PRINCIPLES OF SOLUTION Abstract Only
Y. D. KROPOTOV and V. A. PONOMAREV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 75-76 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 563-575 Original language document was announced in IAA as A86-10696
Avail: NTIS HC A06

The problems of study the neurophysiological processes taking place during visual perception are discussed, including the methods used and the results obtained. The effects of visual stimuli on neuronal impulses and evoked potentials were registered in patients during functional diagnoses with the use of implanted electrodes. It was demonstrated that the processes of visual perception induce neuronal activity in the nuclei of the thalamus and striopallidal system. The nature of these reactions depends on the type of activity initiated by the visual stimuli. A system of psychological tests is proposed for the analysis of characteristic responses in the human brain to somatosensory features of visual stimuli. I.S.

N86-19845# Joint Publications Research Service, Arlington, Va.
RESPIRATORY FUNCTION IN INHABITANTS OF NORTHEASTERN USSR Abstract Only
L. N. MATVEYEV, A. G. MARACHEV, A. N. KOZIN, S. A. KHARKOV, and I. Z. SHERES *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 77-78 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 634-640
Avail: NTIS HC A06

Respiratory function analysis was conducted on 246 inhabitants of northeastern USSR with a mean stay of 9.40 + or - 0.43 years in the region, and 90 newcomers to the area from Moscow. The study groups consisted of both men and women with an

average age for the cohort of 31.4 + or - 0.51 years. The long term residents of the Northeast presented with inferior pulmonary function status in comparison with the newcomers, the deterioration consisting predominantly of inferior gas-exchange parameters and reduction by a third in pulmonary reserve. Maximum gas exchange after 15 years in the northeast was reduced by 45.4% below that seen for the newcomers, and by 27.6% in comparison with immigrants with a 5 year stay. The corresponding reductions in the pulmonary reserve capacity were 45.4 and 20.3%, respectively. The morphological basis of respiratory deterioration in the long term residents of the Soviet northeast was ascribed to marked hypertrophy and hyperplasia of the seromucous glands and the increase in the percentage of goblet cells. Author

N86-19846# Joint Publications Research Service, Arlington, Va.
EFFECTS OF 24 H SLEEP DEPRIVATION ON BIOGENIC AMINE METABOLISM Abstract Only
T. D. BOLSHSKOVA, S. A. MESHCHERYAKOVA, V. F. TYABENKOVA, N. I. ROMANOVA, Y. I. LEVIN, and I. G. DALLAKYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 78-79 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 652-656
Avail: NTIS HC A06

An analysis was conducted on the effects of 24 h sleep deprivation on the metabolism of catecholamines, histamine and serotonin and the completion of recovery after a night's sleep. Measurements of the blood and urine levels of the metabolites in question were conducted on ten healthy males ranging in age from 22 to 27 years. Sleep deprivation of the specified duration resulted in enhanced production and secretion of the biogenic amines, as evidence by elevated urinary levels. In addition, psychological tests during that time showed a positive correlation between changes in the metabolism of the biogenic amines and behavioral performance. Comparison of blood and urine levels demonstrated that the latter status provided a more reliable indication of histamine status. It was also noteworthy that serotonin levels were most refractory to recovery after sleep deprivation, and the connection between depressed levels of serotonin and mental depression after repeated bouts of sleeplessness appears to establish a direct metabolic relationship. Author

N86-19847# Joint Publications Research Service, Arlington, Va.
VISUAL FORM PERCEPTION FROM HALFTONE IMAGES Abstract Only
A. M. KUPERMAN and A. B. KRAVTSOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 79 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 687-689
Avail: NTIS HC A06

Two subjects were employed in an experiment designed to test visual form perception from halftone images and evaluate the importance of orientation selective mechanisms in this function. Analysis of the resultant data indicated that the threshold time limit for perception of the volume parameter from halftone images is on the order of 70 to 180 msec, and depends on the mutal orientation of the test and masking meshwork stimuli to one another. The latency increases with orthogonal orientation. The data were interpreted to indicate that orientational and spatial frequency selective mechanisms are involved in surface form perception from halftone images. These mechanisms can be differentiated into local factors involving evaluation of intensity gradient of the test image, i.e., orientation of the normal to the surface, and nonlocal factors concerned with analysis of contour boundary characteristics. Author

N86-19848# Joint Publications Research Service, Arlington, Va.
PROBLEM OF BIOLOGICAL CLOCKS: NEW DATA ON CIRCADIAN CHANGES IN STATUS OF HUMAN ORGANISM Abstract Only
L. Y. GLYBIN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-001) p 80 2 Jan. 1986 Transl. into ENGLISH from Biofizika (Moscow, USSR), v. 30, no. 4, Jul. - Aug. 1985 p 717-720
Avail: NTIS HC A06

A possible biochemical mechanism has been suggested for endogenous intracellular clocks, suggesting that the biological clock is not a simple two phase day and night clock, but rather a more complex sequence of circadian changes. Results are summarized in a statistical analysis of the circadian rhythm of processes of morbidity, childbirth, domestic injury, traffic accidents and death due to certain diseases. The major result is that various physiological indices of the human body change during the course of the day in a quite complex manner with a regular sequence of phases of increased and decreased intensity of the processes studied. The picture was found to be the same in terms of local time regardless of season of year, latitude or location. Five periods of elevated physiological tone were observed (at 5-6, 11-12, 16-17, 20-21 and 24-1 o'clock) with an equal number of decreases (at 2-3, 9-10, 14-15, 18-19 and 22-23 o'clock). Author

N86-19849# Joint Publications Research Service, Arlington, Va.
ENHANCEMENT OF SOMNIFEROUS EFFECTS OF THERMAL PULSATION BY SIMULTANEOUS APPLICATION TO TWO REFLEXOGENIC ZONES Abstract Only
V. A. LIKHTENSHTEYN and T. M. MUGUTDINOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (PRS-UBB-86-001) p 80 2 Jan. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 4, Jul. - Aug. 1985 p 689-691
Avail: NTIS HC A06

The somniferous effectiveness of simultaneous application of thermal pulses of two reflexogenic zones was tested on 33 healthy young adults, and compared with the results obtained when only the standard zone (nasolabial) or an adjunct zone (paraumbilical abdominal area) were stimulated. Depth of induced sleep was monitored by EEG. The results demonstrated that sleep induction was most effective when the two zones were simultaneously activated by thermal pulses, with 78.8% of the subjects reaching stage 2 sleep in 9.1 min on the average. In this mode only 6.1% of the subjects failed to respond. Stimulation of only the primary nasolabial zone resulted in 60.7% of the subjects entering stage 2 sleep in 12.7 min, while 15.1% failed to respond at all. Stimulation of the paraumbilical alone was least effective, with 36.3% of the subjects failing to respond and only 20.6% reaching stage 2 in 16.8 min. Author

N86-19850* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 281)
Feb. 1986 60 p
(NASA-SP-7011(281); NAS 1.21:7011(281)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 153 reports, articles, and other documents introduced into the NASA scientific and technical information system in January 1986. Author

N86-19851 Marquette Univ., Milwaukee, Wis.
MUSCLE FATIGUE: PHYSIOLOGICAL AND BIOCHEMICAL STUDIES Ph.D. Thesis
J. P. TROUP 1985 139 p
Avail: Univ. Microfilms Order No. DA8516286

The purpose of this study was to examine the etiology of muscle fatigue in fast and slow skeletal muscles giving particular interest to the relationship of H + ion and muscle contractile properties. A further objective as to evaluate to what extent endurance and spring exercise training protects against the development of fatigue. Endurance exercise involved running 1.2 mph at a 15% grade 2

hours per day, 5 days per week for 10 weeks. The spring training program consisted of 6 sprints of 4.5 minute duration at 40 m.min-1 and 15% slope with 2.5 minute rest intervals performanced 5 days per week for six weeks. Muscle fatigue was produced in the predominantly type 1 Soleus, the type 2A and 2B extensor digitorum longus and the type 2B superficial region of the vastus lateralis by electrical stimulation in vitro at 22 C. Muscles were stimulated at 45 trains.min-1 for 1, 5 or 10 minutes. In both training modalities, train tension decreased faster in controls compared to the exercise trained group. This suggested that exercise training leads to a delay in the development of fatigue being most pronounced following a regimen of spring training. Dissert. Abstr.

N86-19852 Harvard Univ., Cambridge, Mass.
LUMINANCE AND CHROMATICITY SIGNAL PROCESSING IN THE HUMAN VISUAL SYSTEM Ph.D. Thesis
G. R. COLE 1985 154 p
Avail: Univ. Microfilms Order No. DA8520180

Luminance (Lum) and Chromatic (Chr) detection mechanisms were revealed with a 1 deg 200 ms test flash presented upon a uniform 6.2 deg yellow field of 3000 td. The test could have any direction in the (L,M) cone quantal catch space. All stimulus components were narrow-band, produced with a 8-channel Maxwellian view optical system. Using pedestals which were flashed coincident in space and time with the test, subthreshold masking and facilitation was obtained for Lum tests upon Lum pedestals and Chr tests upon Chr pedestals. Further increases in the pedestal strength beyond threshold, yielded facilitation independent of the sign of the test and pedestal, followed by a Weberian rise in threshold. Suprathreshold +/- Lum pedestals facilitated the detection of +/- Chr tests (+Chr = green; -Chr = red) by 2 to 3 fold. The facilitation was still apparent for tests and pedestals which were tilted away from the nominal Chr and Lum directions respectively. The results are discussed in terms of spatio-temporal uncertainty and edge effects. Dissert. Abstr.

N86-19853 Minnesota Univ., Minneapolis.
RESTING METABOLIC RATE IN MEN FOLLOWING PROLONGED TREADMILL EXERCISE Ph.D. Thesis
G. R. SHAW 1985 162 p
Avail: Univ. Microfilms Order No. DA8519297

Previous studies have suggested that the resting metabolic rate (RMR) may be elevated for several hours following prolonged exercise and thus contribute significantly to 24-hour energy expenditure. The metabolic responses of 8 men (4 trained runners and 4 sedentary men) were studied during and after treadmill exercise. Each subject was studied on 8 different days: 3 control days (no exercise), 3 days following 45 min of exercise, and 2 days following 90 min of exercise. The trained subjects' exercise intensities averaged 78% and 61% of their maximal oxygen consumption during the 45 min and 90 min exercise bouts, respectively. Corresponding values for the sedentary men were 57% and 46%. Oxygen consumption (VO sub 2), minute ventilation (V sub e), and heart rate (HR) gradually increased during 45 and 90 min of constant-load exercise regardless of training status It is concluded that the total post-exercise increase in energy expenditure following 45 or 90 min of treadmill exercise was at most 4 to 8% of the cost of exercise itself. Dissert. Abstr.

N86-19854 Research Inst. of National Defence, Stockholm (Sweden).
THE ELEVENTH ANNUAL MEETING OF THE EUROPEAN UNDERSEA BIOMEDICAL SOCIETY (EUBS) ON DIVING AND HYPERBARIC MEDICINE
H. OERNHAGEN, ed. and A. L. CARLSSON, ed. Aug. 1985 274 p refs Meeting held in Goetborg, Sweden, 21-23 Aug. 1985
(FOA-C-50021-H1; ISSN-0347-7665) Avail: Issuing Activity

Thermocontrol and pressure effects on divers; pulmonary function during diving and hyperbaric conditions; effects of hydrostatic pressure and gases; and decompression sickness are discussed.

N86-19855 Texas Univ., Austin.
DIVER RESPONSE TO HOT WATER LOSS AT DEPTHS GREATER THAN 300 METERS: EXPERIMENTAL OBSERVATIONS AND THEORETICAL INTERPRETATION
E. H. WISSLER and A. PASCHE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 7-14 Aug. 1985 refs
Avail: Issuing Activity

A mathematical model for simulating human thermal response to exercise and environmental stress is used to analyze experimental data obtained from 2 series of 350 m dives conducted in hyperbaric chambers. When divers wearing standard hot water suits were subjected to brief intervals without flow, they became uncomfortable and began to shiver within a few minutes. The physiological basis for this response and its consequences are discussed. It is concluded that nonuniform distribution of water within the suit, leakage of hot water from the suit at the wrists and ankles, and flushing of cold water into the suit around the hands and feet during a hot water cut are the primary causes of diver discomfort and shivering. Author (ESA)

N86-19856 Chalmers Univ. of Technology, Goeteborg (Sweden). Div. of Underwater Technology.
THE EFFECTS OF THE INSULATION PROPERTIES OF DIFFERENT DRY SUIT SYSTEMS ON THE DIVER'S HEAT BALANCE AND COMFORT DURING DIVING TO 50 M
D. E. WARKANDER, P. A. TRAEFF, and G. O. DAHLBAECK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 17-32 Aug. 1985 refs
Avail: Issuing Activity

A method for quantifying thermal comfort during diving was tested during diving at 5 and 40 m using suits with and without passive insulation. Calculations of the insulation of a suit system were based on measurements of changes in body temperature, mean skin temperature, respiratory heat loss, and metabolism. Metabolism was measured with a technique based on argon dilution and mass spectrometry. Insulation values in the range of 0.10 to 0 15 K/(W/sq m) are measured for the suits, and are considered by divers to yield adequate thermal comfort. Author (ESA)

N86-19857 Bergen Univ. (Norway). Dept. of Chemistry.
A STUDY OF HUMAN LYMPHOCYTE MORPHOLOGY FROM THE PERIPHERAL CIRCULATION AFTER HYPERBARIC EXPOSURE
J. A. PACIOREK *In* Research Inst. of National Defence The 11th Annual Meeting of the Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 33-43 Aug. 1985 refs
Avail: Issuing Activity

Scanning electron microscopy preparation of peripheral blood lymphocytes obtained from divers at the end of a deep dive in whole blood or in separated mononuclear cell fractions, demonstrate membrane changes in those samples that were air dried. Critical point drying of preparations prevents lymphocyte surface morphology collapse. Membrane binding studies indicated that between 24.5% of peripheral mature B and T cells binding sites are compromised after in vitro hyperbaric treatment. In vitro comparison of pre and post pressure stressed cells shows that inappropriate decompression procedures cause damage to the cytoskeletal matrix, with topographical alteration of membrane and antigenic sites. Author (ESA)

N86-19858 Tromsoe Univ. (Norway). Inst. of Medical Biology.
ENHANCEMENT OF PSEUDOMONAS AERUGINOSA VIRULENCE BY HYPERBARIC ATMOSPHERE CONDITIONS
B. P. BERDAL and A. R. EEGAARD *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 45-54 Aug. 1985 refs Prepared in cooperation with Norwegian Defence Microbiological Lab., Oslo
Avail: Issuing Activity

Factors associated with Pseudomonas aeruginosa virulence (bacterial adhesion to human cells in culture, production of exotoxin A, and the activity of extracellular and cell-wall bound proteolytic enzymes) were measured under diving conditions. Toxin production remains undisturbed, but bacterial adhesion and an extracellural proteolytic, elastase-like activity increase. The enhanced adhesion associated with pressure increase is statistically significant for the assayed P. aeruginosa strains. Adhesion is much higher at 37 C than at 22 C. The hyperbaric pressure effect is significant at the higher temperature only. Observations correlate well with reports of external ear canal infections in divers and whirl-pool bathers. Enhanced bacterial adhesion under favorable atmosphere/temperature conditions could be a general phenomenon for the P. aeruginosa bacterial group.
Author (ESA)

N86-19859 Admiralty Research Establishment, Gosport (England). Physiological Lab.
SOME DOMINANT FREQUENCIES OF POSTURAL TREMOR ARE LOWER AT 31 BAR
D. J. HARRIS and Z. TOROK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 55-65 Aug. 1985 refs
Avail: Issuing Activity

To test the hypothesis that the center frequencies of tremor bands are slightly lower at pressure as a consequence of slowed muscle contraction, tremor was studied during a heliox dive to 31 bar. Spectral analysis reveals that the power summed for the 6 to 13 Hz and 13 to 40 Hz bands in the finger increases 2 to 6 and 1.6 to 3.5 fold respectively, while hand tremor power increases from 1 to 6.6 fold. Center frequencies of all hand tremor peaks, (neurological and mechanical in origin) are reduced at pressure by 0.67 to 1.28 Hz. The results support the proposition that reflex and muscle factors play a role in causing or modulating tremor in the high pressure nervous syndrome.
Author (ESA)

N86-19860 Karolinska Inst., Stockholm (Sweden). Dept. of Aerospace and Environmental Medicine.
LUNG VOLUMES AND DYNAMIC COMPLIANCE DURING IMMERSION AND OXYGEN BREATHING
R. BAER, G. O. DAHLBAECK, and U. I. BALLDIN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 67-69 Aug. 1985 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden
Avail: Issuing Activity

The pulmonary mechanics and the time course of lung vital capacity (VC) reductions during immersion and oxygen breathing were investigated using 8 healthy male scuba-divers (mean age 24 yr, range 18 to 30 yr) with body plethysmographic techniques and simultaneous esophageal pressure recordings. The reductions in VC and the symptoms of airway irritation after immersion and oxygen breathing confirm suggestions that this reduction is mainly due to pulmonary absorption atelectasis formation caused by an elevated diaphragm and blood pooling in the thorax, creating closed off basal lung regions. However, the small reductions in residual lung capacity and dynamic compliance during 30 min immersion conditions, while breathing oxygen as well as air, might be explained by an increased lung interstitial fluid interfering with the gas volumes in the lung.
Author (ESA)

N86-19861 Norwegian Underwater Technology Center Ltd., Laksevaag.
EFFECTS OF DRY AND HUMIDIFIED BREATHING GAS (AIR) AT 37 C ON PULMONARY FUNCTION IN HYPERBARIC CONDITIONS
I. ROENNESTAD *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 71-79 Aug. 1985 refs
Avail: Issuing Activity

The effects of breathing humidified air were studied using 7 subjects performing a standard workload task at 1.17, 3.75, and 5.98 bar simulated depths and at the surface. Exposure to humidified breathing gas causes no change in any of the pulmonary function parameters. There are significant decreases in the pulmonary function parameters after exposure to dry breathing gas at 5.98 bar compared to 1.17 bar. At 1.17 bar mean mid expiratory flow (MMEF) is reduced to 94.5 % of the pre-exposure value, while MMEF at 5.98 bar is reduced to 77 % of the pre-exposure value. Data for humidified breathing gas at 5.98 bar are similar to those at 1.17 bar. Changes are probably due to an obstruction in the distal airways. The origin of the obstruction is unknown. It is concluded that humidification of dry breathing gas has an increasingly positive effect with depth on the pulmonary function of the diver.
Author (ESA)

N86-19862 Research Inst. of National Defence, Haarsfjaerden (Sweden).
LUNG RUPTURE AS A COMPLICATION IN FREE ESCAPE
C. LINDEMARK (Submarine Medical Section, Karlskrona, Sweden) and J. ADOLFSON *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 81-84 Aug. 1985 refs
Avail: Issuing Activity

In 104,200 free escapes performed by 9,253 trainess in submarine warfare, 63 cases (frequency of 0.7 %) of lung rupture were observed. Mediastinal emphysema is found in 36 of the cases and pneumothorax in 4 by X-ray examination. Symptoms to be recompressed are thoracic sensations, cerebral symptoms, unconsciousness, subcutanous emphysema, bloody frothy sputum, auscultory crepitations, submucous emphysema and shortness of breath. It is uncommon that people trained in free ascent suffer from lung rupture. It is suggested that training in free ascent in a tank with maximum possibilities of rescue is a way to avoid severe diving accidents in the open sea.
Author (ESA)

N86-19863 Institut National de la Sante et de la Recherche Medicale, Paris (France). Div. d'Exploration Fonctionnelle des Sportifs.
COMPARISON OF BRADYCARDIA BREATH-HOLD ON DIVERS AND NONDIVERS: ITS IMPORTANCE FOR THE CAPACITY VISIT OF DIVERS
D. LAPIERRE, F. FRIEMEL, M. P. CURRALADAS, C. LARGER, and G. CANNET *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 87-92 Aug. 1985 refs
Avail: Issuing Activity

Bradycardia during apneas with face-immersion was tested with 12 divers and 12 nondivers. No statistically significant difference between the two groups as to the average length of breath hold and the frequency of appearance of the electrocardiographic changes is found. Breathing with face immerged (FI) cardia during apnea is significant for nondivers, FI or not. For divers, bradycardia is significant only with FI. The differences in the amplitude of bradycardia between the two groups are not statistically significant. The apnea-training of divers may reduce the parasympathetic sensitivity of the heart. During the capacity visit for candidate divers, the parasympathetic response of the subject should be tested by making him carry out an apnea.
Author (ESA)

N86-19864 Red Cross Hospital, Barcelona (Spain). Centre de Recuperations i d'Investigations Submarines.
EXPLAINING THE UNEXPLAINED DYSBARIC SPORT DIVING ACCIDENTS
X. LOPEZ-ALTIMIRAS, J. PALOMER, J. BORRAS, and J. DESOLA-ALA *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 93-98 Aug. 1985
Avail: Issuing Activity

A total of 181 dysbaric sports diving accident case files were analyzed, and cases where adequate decompression procedures were followed were studied. The patients' personal data (age, physical condition, and background) diving instruction (experience and previous dysbaric disorders), the data which preceeded the dive (continued or successive dives, sailing, previous traveling) and the technical characteristics of the dive itself (exercise at depth, cold water, fatigue) were investigated. Exercise, advanced age, and negligence in applying safety factors are the reasons of the majority of the unexplained accidents. Author (ESA)

N86-19865 Research Inst. of National Defence, Stockholm (Sweden).
AN ATTEMPT TO COUNTERACT NITROGEN NARCOSIS BY NALOXONE ADMINISTRATION
M. H. LINER, O. EIKEN, M. GENNSER, H. ROECKERT, and H. OERNHAGEN *In its* The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 99-104 Aug. 1985 refs Prepared in cooperation with Chalmers Univ. of Technology, Goeteborg, Sweden, and Karolinska Inst., Stockholm, Swedennst. Natl. Defence
Avail: Issuing Activity

In order to evaluate the effect of naloxone (a specific opiate antagonist) on nitrogen narcosis, 8 healthy subjects were exposed to 8.5 ATA air on 2 occasions in a dry chamber. The degree of nitrogen narcosis was assessed by measurement of body sway motion, four-choice visual response time, and paced auditory serial addition test. The subjects assessed perceived degree of narcosis using the Borg category scale. Tests were performed pre and post-dive, and at bottom depth before and after drug administration. Each subject received naloxone (0.02 mg/kg bw) or placebo on separate dives. Drugs were administered intravenously in a double-blind random fashion. At 8.5 ATA performance decreases in all tests indicating nitrogen narcosis. Neither naloxone nor placebo affect performance at pressure. Results suggest that naloxone does not reverse the effects of excessive nitrogen partial pressure on body sway, and psychomotor and cognitive functions.
Author (ESA)

N86-19866 London Univ. (England). Dept. of Chemical Pathology.
ELEVATIONS OF PLASMA ENDOTOXIN LEVELS AND LYSOSOMAL ENZYME ACTIVITIES IN DIVERS DURING A SIMULATED CHAMBER DIVE TO 300 MSW
D. R. DORAN, Z. TOROK (Admiralty Research Establishment, Gosport, England), M. P. GARRARD (Admiralty Research Establishment, Gosport, England), and L. CHAUDRY *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 107-112 Aug. 1985 refs Sponsored by UK Ministry of Defence Procurement Executive
Avail: Issuing Activity

Bacterial endotoxin levels were measured in blood samples taken from 3 men during a simulated chamber dive to 300 msw. Plasma concentrations rise in all 3 men from insignificant pre-dive values to reach levels 10 times the upper limit of normal by the end of compression. The elevations persist well on into the decompression phase. Significant elevations of activities of acid phosphatase and Beta glucuronidase are noted, paralleling the rise in endotoxins. Such lysosomal enzyme activity increases are known to accompany endotoxaemia. The effect of hyperbaric exposure upon the efficiency of destruction of endotoxin by the liver, and/or direct effect of compression upon leakage of endotoxin from the gut are discussed. Author (ESA)

N86-19867 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.
HIGH PRESSURE OXYGEN (OHP) INDUCED INCREASE OF SERUM PROLACTIN IS NOT DUE TO A DOPAMINE (DA)-RECEPTOR BLOCKADE
G. ATHANASSENAS, R. KAISER, H. SCHLEBUSCH (Bonn Univ., West Germany), and R. BERGER *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 113-120 Aug. 1985 refs
Avail: Issuing Activity

A significant increase of serum prolactin (PRL) levels was found after breathing 100% O2 in a simulated depth of 18m, compared to normoxic breathing under the same conditions. In order to distinguish between a decrease of dopamine (DA) and a blockade of the DA post-synaptic receptor, bromocriptine (BRC) a known DA agonist, was administered in a double blind experiment. Eleven male divers participated in 4 series of simulated dives to 18 m breathing 100% O2 in 2 dives (1 with and 1 without BRC administration), and breathing a normoxic mixture in the 2 others (1 with and 1 without BRC administration). It is found that the increase of serum PRL under high pressure oxygen is suspended after BRC administration, suggesting that PRL increase is due to a decrease of DA rather than to a blockade of the post-synaptic DA receptor. Author (ESA)

N86-19868 Royal Netherlands Navy, The Hague. Diving Medical Centre.
EFFECTS OF INTERMITTENT EXPOSURE TO HYPEROXIA IN OPERATIONAL DIVING
W. STERK (Vriens Diving Co.) and L. M. SCHRIER *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 123-131 Aug. 1985 refs
Avail: Issuing Activity

Two groups of 6 divers were exposed to hyperoxic mixtures during 3 no-stop dives of 2 hr duration per day, interrupted by 1 hr surface intervals breathing air, 5 days per week. Group 1 was exposed to 600 cumulative pulmonary toxicity dose (CPTD) and group 2 to 800 CPTD per day. Results show a chronic oxygen toxicity syndrome consisting of symptoms as fatigue, headache, dizziness, and paraesthesia. Most characteristic is a feeling of numbness in fingers and toes. It is uncertain whether these symptoms are of central or peripheral origin. It is concluded that daily exposure to 600 CPTD or more is not safe on a working week basis and as a schedule as in the experiment.
Author (ESA)

N86-19869 Bergen Univ. (Norway). Dept. of Physiology.
INCREASED INOTROPI OF THE HEART IN NORMOXIC HYPERBARIC ATMOSPHERE
L. B. STUHR, A. ASK, and I. TYSSEBOTN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 133-138 Aug. 1985 refs
Avail: Issuing Activity

Cardiac activity of rats in a hyperbaric chamber was studied. A micromanometer independent of saline filled catheters was introduced into the left ventricular heart chamber of anesthetized subjects. Intraventricular pressure and velocity of ventricular pressure increase and decrease were measured in control and during 15 min elevated ambient pressure to 5 bar by He and N2 and 15 min after decompression. The mean arterial pressure and pulse pressure were recorded by a saline filled catheter in aorta via a femoral artery. Elevated ambient pressure (5 Bar) by N2 and He in a normoxic atmosphere increases the inotropi but does not influence the chronotropi and mean arterial pressure. It is suggested that the rat heart has to use a greater force and velocity of contraction to pump the same amount of blood at 5 bar.
Author (ESA)

N86-19870 Institut za Pomorsku Medicina, Split (Yugoslavia).
HYBERBARIC OXYGEN IN THE TREATMENT OF BELL'S PALSY
R. GORAN, D. PETAR, G. STRACIMIR, and K. HASAN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 139-146 Aug. 1985 refs
Avail: Issuing Activity

Twenty patients with Bell's palsy detected 7.6 days previously on average (no longer than 15 days) were treated by hyperbaric oxygen (HBO) at 2.8 bars for 60 min twice a day. A few days after the beginning of the therapy (mean 5.5. days) all but 1 improved and all but 1 healed completely in 17 to 21 days (mean 14.6). In one case decompression rather than HBO was indicated but subject having refused surgery joined oxygen treated group. At admission all patients presented complete paralysis with NET differing 3.5 mA. During therapy none of them developed signs of electrodegeneration. Comparing outcome of Bell's palsy under HBO to the one under medicamentous therapy or spontaneous evolution, HBO cases heal quicker and with no sequella. Author (ESA)

N86-19871 Istanbul Medical Faculty (Turkey). Underwater Medicine Section.
A SURVEY OF ASEPTIC BONE NEGROSIS IN TURKISH SPONGE DIVERS, INTERIM REPORT
M. CIMSIT, C. BABUNA, A. KARACALLIK, G. VARAN, Z. KARAGUELLE, B. ACUNAS, and N. YUEZBASLOGLU *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 147-157 Aug. 1985 refs
Avail: Issuing Activity

Physical examinations, blood and urine analyses, and radiological examinations of divers were completed. They were all actively diving on air. Mean age was 26.1 yr with a range of 19 to 35. The mean years of diving experience was 4.3. The average depth of diving was 35.4 m. Six divers had decompression sickness (DCS). Although aseptic bone necrosis is not found necessarily related with DCS, all cases with DCS have lesions of aseptic bone necrosis; 3 of the 21 divers are free of lesions and 4 have cystic changes and translucent areas in their coracoid process and fibula. Findings indicate a very high incidence of dysbaric osteonecrosis. Eighteen divers have lesions. Humerus is the primary site of affection. All these findings indicate that the high incidence of aseptic bone necrosis among Turkish sponge divers is related to diving habits. Author (ESA)

N86-19872 Slotervaartziekenhuis, Amsterdam (Netherlands).
EARLY DETECTION AND TREATMENT OF AVASCULAR BONE NECROSIS IN DIVERS
R. M. KUIPERS, G. H. C. SCHARDIJN, D. M. A. AGENANT, C. A. HOEFNAGEL, and K. J. HAMELYNCK *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 159-164 Aug. 1985 refs
Avail: Issuing Activity

Dysbaric osteonecrosis diagnosis in divers is discussed. Four weeks after a decompression accident the first signs can be found by a diphosphonate bone-scan. An X-ray investigation is usually positive at a later stage of the disease (1 yr) but the best moment of treatment is gone. If a bone lesion is suspected on clinical examination and bone scintigraphy, further confirmation by intramedullary pressure and phlebography should be performed. In case of a high pressure and a venous stases, a core biopsy with intraossal decompression is indicated. The results of a local treatment of the necrotic part of head in early cases of femoral head necrosis are good, and less disabling than a hip arthrodesis or total hip replacement in cases of bone necrosis with secondary arthrosis. Author (ESA)

N86-19873 Chalmers Univ. of Technology, Goeteborg (Sweden). Lab. of Oral Biology.
ORAL CHANGES IN DIVERS WORKING WITH ELECTRICAL EQUIPMENT UNDER WATER
T. OERTENDAHL *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 165-171 Aug. 1985 refs
Avail: Issuing Activity

An inquiry study among professional commercial divers revealed that 55% complained of a metallic taste, strictly related to their work with electrical equipment under water. A clinical study was performed to see if the metallic taste reflected any clinical alteration. Divers who worked with electrical equipment under water have a significantly more unfavorable clinical appearance of their dental amalgams, in relation to a control group. The metallic taste is probably due to potential alterations in the mouth provoked by increasing humidity in diving suits when operating electrical welding machines. Author (ESA)

N86-19874 Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Dept. of Underwater Medicine.
HYGIENIC ASPECTS OF WATER SUPPLY FOR CHAMBER SANITARY FACILITIES, CHANGES OF DIVERS' BACTERIAL MOUTH FLORA AND EFFECTIVENESS OF EAR PROPHYLAXIS IN SATURATION DIVES
R. KAISER, L. KRIZEK (Bonn Univ., West Germany), M. EXNER (Bonn Univ., West Germany), and L. VOGT *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 173-178 Aug. 1985
Avail: Issuing Activity

In the first of two 230 m saturation dives a continuous spreading and increase of Pseudomonas aeruginosa (mainly PMA 4) was observed inside the chamber although a strict daily disinfection routine was followed. Beginning between day 3 and 5, PMA 4 is observed in all divers. Technical modifications to the water sypply system and the use of a H2O2 based disinfectant markedly improve microbiological water quality and reduce bacterial colonization of the divers in the second dive. For ear prophylaxis (5 min twice daily) 70% ethanol or AL-acetate/acetic acid was used. No case of manifest otitis externa occurs. Author (ESA)

N86-19875 Bergen Univ. (Norway). Inst. of Physiological Psychology.
PSYCHOLOGICAL AND PHYSIOLOGICAL STRESS REACTIONS AMONG SPORTS DIVER-STUDENTS
A. JENSEN, R. VAERNES, and K. T. STOKKE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 179-189 Aug. 1985 refs Sponsored in cooperation with Norwegian Underwater Technology Center and National Hospital of Norway
Avail: Issuing Activity

The existence of a significant activation or stress to perform emergency procedures in water, and coping throughout dive training were studied. Pre and post activation on dives 1 and 6 were measured (5 m depth). Correlations between endocrine reactions, subjective fear rating, frequency of symptoms postdive and personality were obtained. There is a significant activation to the sea dive. However, students either really cope with the environment, or show a very large change in endocrine status. There are broad individual variations regarding coping throughout training. As found among navy divers loss of coping is related to high defense strategies. Author (ESA)

N86-19876 Hamilton Research Ltd., Tarrytown, N.Y.
REPETITIVE DECOMPRESSION TABLES FOR NO-STOP EXCURSIONS FROM SATURATION
R. W. HAMILTON and D. J. KENYON *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 191-198 Aug. 1985 refs Sponsored by NOAA and the Dept. of Commerce
Avail: Issuing Activity

The classical gas loading method for calculating repetitive tables was used to calculate many sequences of excursions separated by various surface or habitat intervals. These were done for different excursion storage depths, vertical excursion distances, and interdive intervals. The allowable bottom time may be shorter for the second dive and even shorter for subsequent excursions. For a given depth-time combination the required adjustment is determined almost entirely by its order in the sequence and the duration of its preceeding interdive interval; the tables use these factors rather than repetitive groups. A linear interpolation method is used to account for excursions that use less than the total allowable time. Author (ESA)

N86-19877 Copenhagen Univ. (Denmark).
EXCURSION LIMITS IN SHALLOW WATER HELIOX SATURATION DIVING
J. MADSEN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 199-201 Aug. 1985 refs
Avail: Issuing Activity

Discrepancies between experimental results on which tables for unlimited duration excursions from shallow heliox saturation are calculated are noted. Reasons for the discrepancies, and their significance for diving safety are discussed. Discrepancies may be due to the differences between experiment designs, particularly populations tested. Author (ESA)

N86-19878 Duesseldorf Univ. (West Germany). Inst. fuer Biophysik und Elektronenmikroskopie.
WET CHAMBER DIVES TO TEST ALGORITHMS FOR ELECTRONIC DECOMPRESSIOMETERS
M. HAHN, P. HAMPE (DFVLR, Cologne, West Germany), and S. JOHN (Deutsche Lebensrettungsgesellschaft, Berlin, West Germany) *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 203-211 Aug. 1985 refs
Avail: Issuing Activity

Wet chamber dives, simulating nonrectangular profiles and repetitive diving common in sports-diving, were performed to test a decompression model and supersaturation tolerances used in an electronic decompressiometer. Ultrasonic Doppler bubble measurements were made during test-dives. Occurrence of type 1 decompression sickness and peculiarities in the bubble history suggest that denitrification is delayed by decompression stress. Author (ESA)

N86-19879 Saitama Univ., Urawa (Japan). Dept. of Hygiene.
AN APPRAISAL OF DIVE PROFILES IN SHELLFISH DIVERS WITH REFERENCE TO THE RISK OF DECOMPRESSION SICKNESS
I. NASHIMOTO, K. KOBAYASHI, and Y. GOTOH *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 213-219 Aug. 1985 refs
Avail: Issuing Activity

The dive profiles of six helmet shellfish divers were recorded and venous gas emboli (VGE) of divers after surfacing were monitored. Theoretical tissue nitrogen pressure (TNP) and decompression thresholds (DTHs) were calculated. Dive depth was 16 to 36 m, bottom time 16 to 36 min, and total ascent time 16 to 29 min. The first decompression stop was usually taken at 20 m, the second at 10 to 5 m. Constant fluctuations in diving depth were seen at the bottom. At each decompression stop the diver moved up and down within a range of 2 to 6 m. Grade 2 VGE is detected among 3 divers after surfacing from the second dive. No DCS is observed. With few exceptions, their empirical decompression profiles do not exceed the DTHs. This may be related to the reduced risks of DCS. Author (ESA)

N86-19880 Royal Norwegian Navy, Haakonsvern. Bureau of Ships.
ALTERNATIVES TO STANDARD AIR TABLES
A. J. ARNTZEN *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 221-228 Aug. 1985 refs
Avail: Issuing Activity

Diving companies used an empirically modified surface decompression table with nitrox. This combination gives very long bottom times compared to standard air tables. Experience from several thousand dives (salvage and construction) proves that bends frequency is satisfactory. Evaluation of 2662 dive reports shows that the procedures are safe enough to be recommended for official use, with minor modifications. Author (ESA)

N86-19881 Compagnie Maritime d'Expertises, Marseille (France).
THE INFLUENCE OF INDIVIDUAL FACTORS IN MAN ON BUBBLE FORMATION IN AIR DIVING DECOMPRESSION
M. CARLIOZ, M. COMET, and B. GARDETTE *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 229-239 Aug. 1985 refs
Avail: Issuing Activity

The influence of biometric factors on decompression was studied in 78 air dives of 78 male subjects at 24 m 90 min bottom time, 30 m 80 min, and 51 m 40 min. Results show that factors which influence individual susceptibility to eliminate gas as bubbles, and consequently to pathological risk, are age, weight, and fat tissue. The statistical results were extended to 133 unit air chamber dives. The correlation coefficients are: 0.45 for age, 0.32 for fat tissue, and 0.28 for weight. Thus, there is not a sole determining factor but it appears that the sum of these 3 factors (age + weight + fat tissue : $r = 0.52$) induces pathogenic bubble formation during decompression. Author (ESA)

N86-19882 Direction des Constructions et Armes Navales, Toulon (France). Centre d'Etudes et de Recherches Techniques Sous-Marines.
ULTRASONIC DETECTION OF CIRCULATING BUBBLES IN EWES EXPOSED TO SIMULATED DIVES DEEPER THAN 800 MSW UNDER ISOBARIC CONDITIONS AND WITH UNCHANGED GAS MIXTURES
G. MASUREL, J. HEE, L. GIACOMONI, and R. GUILLERM *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 241-246 Aug. 1985 refs
Avail: Issuing Activity

As part of a study intended for the in vivo checking of blood gases in animals exposed to high pressures, ewes were exposed to simulated saturation dives with heliox under normoxic conditions at depths between 800 and 1000 msw. Circulating bubbles are reported during the simulated dives and during stops at the bottom, although conditions were isobaric, and the gas mixture was not changed. Author (ESA)

N86-19883 Red Cross Hospital, Barcelona (Spain). Centre de Recuperacio i de Investigacions Submarines.
LESS BUBBLE FORMATION IN WOMEN DIVERS
J. DESOLA-ALA and G. MASUREL *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 247-256 Aug. 1985 refs Prepared in cooperation with Direction des Constructions et Armes Navales, Toulon, France
Avail: Issuing Activity

Nine couples (1 man, 1 woman) performed identical dives at depths varying from 40 to 50 msw during enough time to produce a residual nitrogen coefficient L according to US Navy decompression tables. Circulating bubbles in the precardial region were determined immediately after the dive and every 30 min during 2.5 hr. Seven men produce detectable bubble degrees in at least one observation, while only three women do so. The men show a higher number of positive determinations and higher degrees of circulating bubbles. No correlation with individual or technical factors can be clearly signaled as responsible for these variations. It is suggested that women divers produce a less bubble degree than men, and their proneness to decompression sickness is related to other physiological factors. Author (ESA)

N86-19884 Japan Marine Science and Technology Center, Tokyo. Dept. of Undersea Science and Technology.
EFFECT OF LOW AND HIGH ENVIRONMENTAL TEMPERATURES ON DECOMPRESSION SICKNESS IN THE AGING RAT
Y. TAYA, F. SHIDARA, Y. MIZYSHIMA, M. NAKANO, N. NARAKI, K. TAKAO, and K. SEKI *In* Research Inst. of National Defence The 11th Annual Meeting of the European Undersea Biomedical Society (EUBS) on Diving and Hyperbaric Medicine p 257-261 Aug. 1985 refs
Avail: Issuing Activity

The combined effects of aging and environmental temperature on decompression sickness incidence in male and female rats (10, 36, and 60 weeks old) in a compression chamber pressurized with air to 11 bar in 10 min were studied. Temperature was controlled at 20 and 30 C, and freely ventilated. Following a 40 min stop at 11 bar, the rats were decompressed in stages, and fatality ratio observed. The results demonstrate a significant relationship (at 0.01%) between aging and fatality ratio; fatality ratio increases under low environmental temperature compared to high environmental temperature. There is little gender effect on fatality. Author (ESA)

N86-19885*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CUTTING HEAD FOR ULTRASONIC LITHOTRIPSY Patent Application
E. D. ANGULUO and R. GOODFRIEND, inventors (to NASA) 30 Oct. 1985 10 p
(NASA-CASE-GSC-12944-1; NAS 1.71:GSC-12944-1; US-PATENT-APPL-SN-793006) Avail: NTIS HC A02/MF A01 CSCL 06E

A cutting head for attachment to the end of the wire probe of an ultrasonic kidney stone disintegration instrument is described. The cutting head has a plurality of circumferentially arranged teeth formed at one end thereof to provide a cup shaped receptacle for kidney stones encountered during the disintegration procedure. An integral reduced diameter collar diminishes stress points in the wire and reduce breakage thereof. NASA

N86-19886*# California State Coll., Bakersfield.
GENERAL AUTOMATIC COMPONENTS OF MOTION SICKNESS
S. SUTER, W. B. TOSCANO, J. KAMIYA, and K. NAIFEH 1985 37 p refs Prepared in cooperation with California Univ., San Francisco
(Contract NCC2-115)
(NASA-CR-176516; NAS 1.26:176516) Avail: NTIS HC A03/MF A01 CSCL 06S

A body of investigations performed in support of experiments aboard the space shuttle, and designed to counteract the symptoms of Space Adapatation Syndrome, which resemble those of motion sickness on Earth is reviewed. For these supporting studies, the automatic manifestations of earth-based motion sickness was examined. Heart rate, respiration rate, finger pulse volume and basal skin resistance were measured on 127 men and women before, during and after exposure to nauseogenic rotating chair tests. Significant changes in all autonomic responses were observed across the tests. Significant differences in autonomic responses among groups divided according to motion sickness susceptibility were also observed. Results suggest that the examination of autonomic responses as an objective indicator of motion sickness malaise is warranted and may contribute to the overall understanding of the syndrome on Earth and in Space. Author

N86-19887# Massachusetts Univ., Amherst. Dept. of Psychology.
BIOLOGICAL INVESTIGATIONS OF ADAPTIVE NETWORKS. NEURONAL CONTROL OF CONDITIONED RESPONDING Annual Technical Repor, 30 Apr. 1984 - 20 May 1985
J. W. MOORE 20 May 1985 26 p
(Contract AF-AFOSR-0215-83)
(AD-A160345; AFOSR-85-0746TR; ATR-2) Avail: NTIS HC A03/MF A01 CSCL 06P

Neurobiological investigations of adaptive neural networks were conducted using the classically conditioned nictitating membrane response (NM CR) of rabbit, a widely used model system for studies of learning. One experimental approach involved recording from single brain neurons from awake, behaving animals for the purpose of determining the loci and characteristics of neurons with activity correlated with the NM CR or its inhibition. A second approach involved the use of discrete brain lesions that selectively eliminate the NM CR while at the same time sparing the basic reflex pathway. A third approach employed fiber-tracing anatomical techniques designed to clarify the inter-connectivity among brain regions essential for the NM CR. These regions include discrete portions of the cerebellum and brain stem. Information from physiological studies has been incorporated into mathematical models of learning used by adaptive network researchers, and anatomical findings have guided the development of related neuronal models. GRA

N86-19888# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
A STUDY OF PATIENT'S SELF-IMAGE DURING ORTHODONTIC TREATMENT M.S. Thesis
B. B. JACOBUS, JR. Jun. 1985 126 p
(AD-A160751; AFIT/CI/NR-85-117T) Avail: NTIS HC A07/MF A01 CSCL 05J

There has been little research done that has attempted to study the patient's self-image and record what changes occur with a correction of the patient's malocclusion through orthodontic treatment. A study was done to determine what changes occur in the orthodontic patient's self-image during orthodontic treatment. A questionnaire requiring responses pertaining to self-image was distributed to three hundred sixty 11 to 19-year old patients in various phases of pre-treatment and retention. The data was collected and statistically analyzed. Variables of age, sex, and time in treatment were examined. Findings indicated a definite positive effect upon the orthodontic patient's self-image. Significant differences in response levels of different age groups, time in treatment groups and males and females were found. The effects

on self-image were the largest during the first year of active treatment and remained at a higher level throughout treatment. The positive self-image levels continued through the retention phase of treatment. GRA

N86-19889# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
IN VITRO COMPARISON OF ZINC PHOSPHATE AND GLASS IONOMERS ABILITY TO INHIBIT DECALCIFICATION UNDER AND ADJACENT TO ORTHODONTIC BANDS M.S. Thesis
D. J. COPENHAVER Aug. 1985 60 p
(AD-A160881; AFIT/CI/NR-85-141T) Avail: NTIS HC A04/MF A01 CSCL 06E

Forty sets of impacted third molar teeth were banded with custom fitted bands and cycled in a latic acid solution for four weeks. This solution simulates an environment that would be found only in patients with the worst oral hygiene. Each set was from the same patient. Visual, spectrophotometric and pH testing were done on the sample sets. All area not banded showed significant decalcification after four weeks in the 0.10 M latic acid solution. The teeth banded with glass ionomer cement showed significantly more calcium was present in solution in the zinc phosphate cemented sample solutions also confirmed were more Ca(++) ions in solution. The evidence suggest that glass ionomer cement protects the tooth surfaces from decalcification under and adjacent to orthodontic bands significantly better than zinc phosphate cements. Further study on solubility and setting time of this new glass ionomer cement is necessary before routine clinical use can be considered. Author (GRA)

N86-19890# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
PASSING SCORES FOR THE FAA ATCS COLOR VISION TEST
J. J. CONVEY Aug. 1985 19 p
(AD-A160889; DOT/FAA-AM-85-7) Avail: NTIS HC A02/MF A01 CSCL 06P

In response to recommendations from the Office of Personnel Management for measures of normal color vision that reflects as closely as possible the functional color vision requirements for an air traffic controller (Christup, 1981), subtests which simulated ATC tasks were developed in three content areas: (1) aircraft colors for fuselage and lights, (2) color weather radar displays, and (3) navigational chart terrain elevations. Pickrel and Convey (1983) performed an item analysis on these subtests using data obtained from 41 persons with normal color vision as determined by their performance on the Pseudoisochromatic Plates Test (PIP) from the American Optical Corporation and 22 persons with defective color vision according to the PIP. The item parameters and the internal consistency reliability estimates obtained were satisfactory. GRA

N86-19891# Naval Health Research Center, San Diego, Calif.
ASSESSING THE HEALTH RISKS OF CARRIER LANDINGS IN US NAVY PILOTS Interim Report
A. HOIBERG and R. G. BURR Jul. 1985 12 p
(AD-A160928; AD-F630624; NAVHLTHRSCHC-85-24) Avail: NTIS HC A02/MF A01 CSCL 01B

Landing an airplane on an aircraft carrier is one of the most demanding and complex tasks required of Navy pilots. Heart rate values in pilots increase during flight, especially during landings and launch. Because of the hazards involved, carrier landings might have an impact on the health of Navy pilots. This study was designed to determine whether or not carrier landings adversely affected the health of Navy pilots. The objective was to compare the hospitalization and mortality rates of helicopter pilots and fixed-wing pilots who had considerable carrier landing experience with a control group of pilots who had little, if any, carrier landing experience. Results of comparisons across carrier landing exposure groups revealed no significantly higher total hospitalization rate of any one of the three groups. GRA

N86-19892# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
INVESTIGATION OF THE METHOD TO DETERMINE CARBOXYHAEMOGLOBIN IN BLOOD
D. M. KANE Aug. 1985 66 p
(AD-A161061; DCIEM-85-R-32) Avail: NTIS HC A04/MF A01 CSCL 06A

The current method for determining blood carboxyhemoglobin concentration by gaschromatography has been critically evaluated and compared to spectrophotometric analysis methods. The major sources of bias in the method accuracy have been found to be in the measurement of blood volume and in the separate determination of total hemoglobin concentration in the blood. The method is estimated to have a coefficient of variation of 6.2% over the range of 0.5 to 20 vol % COHb. Standardization procedures which have been examined are the use of a 500 ppm carbon monoxide in nitrogen gas mixture and carbon monoxide-saturated blood solutions as external standards. Also, methods of saturating blood with carbon monoxide have been examined, with the use of an impinger or tonometer held at 37 C giving the most effective results. Studies of long-term storage of carbon monoxide blood have been carried out and have revealed that the concentration remains stable for up to nine days if the blood is stored anaerobically at refrigerator temperatures. Blood containing 10% or less carboxyhemoglobin has been found to be stable up to 60 days. GRA

N86-19893# Naval Submarine Medical Research Lab., Groton, Conn.
BODY WEIGHT CHANGES BEFORE AND AFTER SUBMARINE PATROLS Interim Report
K. R. BONDI and A. N. BEARE 25 Sep. 1985 9 p
(AD-A161144; NSMRL-1062) Avail: NTIS HC A02/MF A01 CSCL 06P

Analysis of pre- and post-patrol body weight of 670 men from the crews of seven submarines showed that 32% of the men gained weight, 52% lost, and the 12% did not change. From the magnitude of individual weight losses, it was inferred that as many as a third of the men may have been actively dieting. These data do not support the widespread belief that men tend to gain weight during submarine patrols. Author (GRA)

N86-19894# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE ABSORPTION OF BENZENE THROUGH HUMAN SKIN
J. HANKE, T. DUTKIEWICZ, and J. PIOTROWSKI 28 Oct. 1985 22 p Transl. into ENGLISH from Medycyna Pracy (Poland), v. 12, no. 5, 1981 p 413-426
(AD-A161157; FTD-ID(RS)T-0395-85) Avail: NTIS HC A02/MF A01 CSCL 06T

As a result of the proliferation of benzene solutions in several production technologies and of leading to prolonged exposure poisonings, the question of absorption through the skin has re-emerged with respect to the direction of preventive measures and the necessity to clarify the observed clinical signs of absorption. The absorption of benzene through the skin in men in experimental conditions was examined. The liquid benzene was absorbed with the velocity about 0,4 mg/sq cm/hour; the absorption of the benzene vapors was insignificant and it did not exceed 1 per cent of that absorbed throughout the respiratory ways in the same conditions. The study was based on the determination of phenol contents in urine and on the new direct chemical method for the designation of skin absorption of benzene, this method was described in the paper. The authors concluded that the absorption of benzene through the skin must not be neglected. GRA

N86-19895# Naval Postgraduate School, Monterey, Calif.
EXAMINATION OF RETINAL PATTERN THRESHOLD LEVELS AND THEIR POSSIBLE EFFECT ON COMPUTER ACCESS CONTROL MECHANISMS M.S. Thesis
D. K. HELLE Sep. 1985 48 p
(AD-A161213) Avail: NTIS HC A03/MF A01 CSCL 06B

The advent of multi-programming and the proliferation of shared computer systems has increased the need for greater computer security. Computer security can be segmented into six categories: physical, hardware, software, personnel, communications and procedures. Embedded into software security are those features which protect the system against both unauthorized access and denial of service of authorized users. Another term for this is access control. Access control mechanisms verify an individual's identity via three distinct methods: (1) something an individual knows, (2) something an individual possesses or (3) something about the individual. One device which keys on something about the individual is a retinal scan system. This system utilizes the retinal blood vessel pattern as a unique identifier. This thesis studies one such retinal pattern recognition device. For the purposes of this study, an experiment was designed and conducted which determined the reliability of this system as a function of various tolerance levels, as well as its applicability as a computer systems access control mechanism. The Eye Dentify 7.5 system proved to be a fairly expensive, highly reliable access control device. Its probability for false recognitions is far better than most other known devices. It can be used as a physical access device at virtually any military installation where access devices are used. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-23705
EFFECT OF WORKLOAD ON THE AUDITORY EVOKED BRAINSTEM RESPONSE
K. GILLILAND (Oklahoma, University, Norman), C. SHINGLEDECKER (USAF, Workload and Ergonomics Branch, Wright-Patterson AFB, OH), G. WILSON, and K. PEIO (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 37-39. refs

The purpose of this study was to explore the effect of workload level of a grammatical reasoning task on the auditory brainstem evoked response. Ten male subjects were administered three difficulty levels of a grammatical reasoning task. Brainstem evoked responses were recorded before and after the randomly presented workload conditions, as well as during each workload condition. The results revealed a consistent increase in Wave VI latency during all workload conditions, but no apparent differentiation between workload conditions. Post-test brainstem measures revealed that latency of Wave VI did not recover to pre-test baseline levels. Author

A86-23709* Old Dominion Univ., Norfolk, Va.
THE EFFECTS OF SIMULATOR AND AIRCRAFT MOTION ON EYE SCAN BEHAVIOR
J. R. COMSTOCK, JR. (Old Dominion University, Norfolk, VA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 128-132. refs
(Contract NGT-47-003-800)

In a series of three experiments on the effects on eye-scan behavior of both simuator and aircraft motion, the sensitivity of an oculometric measure to motion effects was demonstrated. 'Fixation time', defined as the time the eyes spend at a particular location before moving on (saccade) to another fixation point, was found to be sensitive to motion effects in each of the experiments conducted. The results of the present study support the hypothesis that motion serves an alerting function, providing a 'cue' or 'clue' to the pilot that 'something happened'. The results do not support the hypothesis that direction of motion is conveyed through the type of motion information employed in these experiments. Author

A86-23715
AN EVALUATION OF AVIATOR TRAINING ABILITY REQUIREMENTS SCALE RATINGS
D. M. MCANULTY and D. H. JONES (Anacapa Sciences, Inc., Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 356-360. Army-supported research. refs

It is pointed out that the ability requirements approach to job analysis has been effectively employed in a wide range of occupational specialities. This approach is based on the premise that a job can be described in terms of abilities required to perform the tasks associated with the job. The usefulness of the ability requirements approach has been repeatedly demonstrated. A recurrent problem, however, is related to the generally low level of agreement among raters with respect to the ratings. Thus, it has been found that 16 to 25 raters must be considered to obtain average ratings which are consistent. The present paper is concerned with ability requirements analyses limited to the instrument phase of Army helicopter training. Attention is given to details regarding the method, psychometric analyses, ratings transformation and evaluation, and a factor analysis of the normalized task-ability ratings. G.R.

A86-23716
AN EXAMINATION OF ABILITY REQUIREMENTS FOR VARIOUS ROTARY WING MISSIONS
D. H. JONES and D. M. MCANULTY (Anacapa Sciences, Inc., Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 361-365. refs

The increasing specialization of rotary wing missions and aircraft has led to a reanalysis of traditional strategies for assigning student aviators to one of four rotary wing missions, including cargo, utility, aeroscout, or attack. The present paper has the objective to present analyses of data, originally compiled by Myers et al. (1982), which suggest that ability requirements for the four missions are indistinguishable when the most demanding mission tasks are included in the basis of comparison. G.R.

A86-23717
PRODUCTIVITY AND DIFFICULTY AS NEW CRITERIA FOR VALIDATING AVIATOR SELECTION TESTS
B. D. SHIPLEY, JR. (U.S. Army, Research Institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 366-369. refs

The U.S. Army Research Institute is conducting research to improve the quality of the Army's aviator selection testing program. The research is motivated by increasing costs of training and by changing aviator ability requirements due to advanced aircraft and modern tactics. This paper describes the development of a new criterion variable to support the testing improvement research. Author

A86-23718
RETENTION OF HELICOPTER FLIGHT SKILLS - IS THERE A 'CRITICAL PERIOD' FOR PROFICIENCY LOSS?
J. W. RUFFNER, D. T. WICK (Anacapa Sciences, Inc., Fort Rucker, AL), and W. R. BICKLEY (U.S. Army, Research Institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 370-374. Army-supported research. refs

The maintenance of the flight proficiency of aviators represents a vital problem for Army aviation. Ruffner and Bickley (1983) conducted an investigation of the loss of helicopter contact flight skills over a six-month period during which active duty Army aviators did not fly. According to the results of this study, there was no significant loss in flight proficiency during the six-month period. The present paper reports data which extend the findings of Ruffner and Bickley to no-flying periods longer than six months. The conclusions about the retention of helicopter contact flight skills are discussed. There is little significant proficiency loss in either psychomotor or procedural tasks for as many as six months of no flying. There is a significant decrease in proficiency for aviators who have not flown for one year. The rate of proficiency loss is greater for no flying periods between six months and one year than for periods of no flying greater than one year. G.R.

A86-23719
CONSERVING INSTRUCTIONAL TRAINING RESOURCES THROUGH USE OF THE PERSONALIZED SYSTEM OF INSTRUCTION
D. T. WICK, J. W. RUFFNER (Anacapa Sciences, Inc., Fort Rucker, AL), and W. R. BICKLEY (U.S. Army, Research institute, Fort Rucker, AL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 375-378. Army-supported research.

In connection with the Individual Ready Reserve (IRR) program, a need exists to develop a training program to be used by units commanders to retrain IRR aviators effectively and efficiently. In response to this need, the Army Research Institute Field Unit developed a standardized training program designed to retrain IRR aviators following varying periods of not flying with the active Army. However, it was found, that according to this program, instructor pilots (IPs) had to spend an unacceptable large amount of time with academic portions. The present paper reports research which was undertaken to develop and to evaluate a revised program that would minimize the time IPs would have to devote to academic training. G.R.

A86-23720
USE OF A SIGNAL DETECTION PARADIGM TO ASSESS SUBJECTIVE INTERSECTION POINTS IN A TARGET LOCATION TASK
W. R. ENGELMAN, M. J. PATTERSON, and G. M. CORSO (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 380-382. refs

Numerous tasks require individuals to assess whether two or more moving points are on a collision path. However, evidence available, on decision making in spatial manipulation tasks, is lacking. This study attempted to assess individual's ability to determine the point of intersection between two cursors. The distance between a specified target and the actual intersection point (2 levels), and the extrapolation distance (2 levels) was varied. Using a signal detection paradigm, measures of sensitivity (d') and decision criterion (B) were obtained. Therefore, 2 x 2 within subjects design was employed. Results indicated that distance between the target and actual intersection point had the greatest effects on sensitvity, while extrapolation distance differences were minimal. Conclusions based on the results are limited due to poor subject performance. Author

A86-23721
THE DETECTION AND IDENTIFICATION OF PICTORIAL CHANGES BETWEEN SUCCESSIVE PRESENTATIONS
M. S. WOGALTER (Rice University, Houston, TX) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 388-392.

In research on picture recognition, much attention has been given to the ability to recognize a picture as identical or different from a previously presented picture. The present paper is concerned with an investigation which utilizes a task which required the processing of meaningful visual information contained in a complex scene. Then the subject is required to notice and identify a change in a subsequent examination of the scene. Three experiments are discussed. The experiments show that an advantage of additions over deletions occurred only for pattern changes and not for object changes. G.R.

A86-23722
DOES LOCATION CUEING INCREASE THE EFFICIENCY OF THE EARLY STAGES OF PERCEPTUAL PROCESSING?
L. A. ANDERSON, D. M. LANE, and J. A. KLEISS (Rice University, Houston, TX) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 393-397. refs

If the location in which a visual stimulus is to be presented is precued, the speed or accuracy of the response to the stimulus is increased. This finding has generally been taken as evidence that cueing speeds up perceptual processing at an early stage. According to Duncan (1981), who assumes two levels of processing, position cueing facililitates selection from the first level to the second level but does not affect first level processing. The present paper reports experiments which employ a logic similar to that used by Sternberg (1969) in his additive factors method to distinguish between these possibilities. The experiments employed a discrimination task in which the subjects were to determine as quickly and as accurately as possible which of two stimuli had been presented. The obtained results contradict the hypothesis that spatial cueing affects the early stages of perceptual processing. G.R.

A86-23726* Illinois Univ., Urbana.
WHY DO PERFORMANCE AND SUBJECTIVE WORKLOAD MEASURES DISSOCIATE?
Y.-Y. YEH and C. D. WICKENS (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 504-508. NASA-supported research. refs

A set of three experiments are described that examine the sources of information processing that produce a dissociation between subjective workload measures and performance. The results support a theory of the dissociation. Subjective measures are driven more by the number of tasks currently performed. Subjective measures are also less sensitive to resource competition than performance measures are. Factors that demand more resource investment improve performance, but these factors also increase subjective ratings of workload. Author

A86-23727
ACQUISITION OF PERCEPTUAL-MOTOR SKILL - ADAPTIVE AND PART-WHOLE TRAINING
A. M. MANE (Illinois, University, Urbana) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 522-526. refs

The effectiveness of two training methods was investigated in the training of a complex perceptual-motor skill. Subjects learned how to play a computer controlled video-game. In adaptive training, pacing of the game elements was the adaptive variable. In the part training condition subjects received training in four subtasks which were designed to train specific elements of the skill

necessary for the performance of the task. A comparison of training time as well as performance at fixed time points against a control group indicated that the training manipulations were effective. The part training method was clearly the best. The adaptive training method yielded mixed results. However, some support for the effectiveness of the method was observed. The results are discussed in terms of the principles for design of training devices and programs. Author

A86-23730
THE EFFECTS OF AERIAL PERSPECTIVE ON ALTITUDE ESTIMATION
M. J. PATTERSON and E. J. RINALDUCCI (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 542-544. refs

In the context of an increasing interest in the use of simulations as training devices for a greater variety of flight tasks, there is a need for the development of effective methodologies to evaluate the visual displays within a simulator. The cues utilized by pilots in the maintenance of altitude have been examined. One visual cue potentially available within a flight setting is related to the aerial perspective. Aerial perspective can be defined as a haze, which, due to particulates suspended in the atmosphere, attenuates hue and contrast. This phenomenon results in the blurring of subjects with increases in distance. Rock (1975) has suggested that aerial perspective may not in fact be used as an independent cue for depth. Nelson and Ritchie (1976) have studied the contribution of aerial perspective to the determination of depth. The present investigation represents an extension of the earlier studies. The results suggest that the ability to estimate altitude using different levels of aerial perspective is related to the degree of previous flight experience. G.R.

A86-23731
THE OPTIMUM PRESENTATION OF COGNITIVE TRAINING DURING A FLIGHT TRAINING PROGRAM
B. A. SMITH (Seville Training Systems Corp., Pensacola, FL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 620-624. Research supported by the Seville Training Systems Corp. refs

Four groups of subjects (N = 8 in each group) were presented training, based on the cognitive aspects of a basic flight maneuver, at different times during the acquisition of the motor skills needed to perform that maneuver. Results indicate that the performance of the group that received extensive cognitive training prior to attempting the associated motor skills was significantly better (p less than .05) than the groups that received the same cognitive training interspersed during the initial learning of the motor skills. This was true even when the interspersed training was preceded by extensive cognitive pretraining. Results also show that cognitive training interspersed with motor skill learning produced a deterioration in performance as the performance of the two groups receiving the training was below that of the control group which received no cognitive training whatsoever. Transfer of training to a similar maneuver indicated that the groups that were initially trained using extensive cognitive pretraining performed significantly better than the groups that received only interspersed cognitive training and the control group. Author

A86-23732
PERSONALITY DIFFERENCES AS A MODERATOR OF MENTAL WORKLOAD BEHAVIOR - MENTAL WORKLOAD PERFORMANCE AND STRAIN REACTIONS AS A FUNCTION OF COGNITIVE COMPLEXITY
M. M. ROBERTSON (Southern California, University, Los Angeles, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 690-694. refs

A86-23733* Maryland Univ., Baltimore.
EVENT-RELATED POTENTIAL INDICES OF WORKLOAD IN A SINGLE TASK PARADIGM
R. L. HORST, R. C. MUNSON (ARD Corp., Columbia, MD), and D. S. RUCHKIN (Maryland, University, Baltimore) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 727-731. refs
(Contract NAS1-17576)

Many previous studies of both behavioral and physiological correlates of cognitive workload have burdened subjects with a contrived secondary task in order to assess the workload of a primary task. The present study investigated event-related potential (ERP) indices of workload in a single task paradigm. Subjects monitored changing digital readouts for values that went 'out-of-bounds'. The amplitude of a long-latency positivity in the ERPs elicited by readout changes increased with the number of readouts being monitored. This effect of workload on ERPs is reported, along with plans for additional analyses to address theoretical implications. Author

A86-23739
OPERATOR LOADING EFFECTS IN A SIMULATED TACTICAL DECISION-MAKING PROBLEM
S. G. HUTCHINS, F. L. GREITZER, and R. T. KELLY (U.S. Navy, Personnel Research and Development Center, San Diego, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 879-883. refs

The objective of this effort was to explore the nature of the degradation in performance, in a military command and control environment, when human capacity limits are exceeded. In dual-task situations, operators were able to perform a primary anti-war warfare task with little degradation but at the expense of the concurrent task. However, a distinction should be made between an operator's rate of output and the quality of performance. Few operators ever used strategies that would minimize overall threat. Thus, in high-density situations, operators may be highly productive but decidedly suboptimal. Use of decision aids in this critical area may be very effective. Author

A86-23745* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
INFLIGHT EVALUATION OF FOUR MEASURES OF PILOT WORKLOAD
S. G. HART (NASA, Ames Research Center, Moffett Field, CA), J. R. HAUSER (Ford Aerospace and Communications Corp., Sunnyvale, CA), and P. T. LESTER (San Jose State University, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 945-949. refs

Four measures of pilot workload were tested in the NASA C-141 Kuiper Airborne Observatory. The measured included a communications analysis, subjective ratings of workload, subjective ratings of additional factors related to workload, and heart rate. Data were collected for 11 flights, each of which lasted approximately seven hours. Heart rate was found to be significantly higher for the pilot who was flying than for the pilot who was not flying and it varied significantly across flight segments, peaking during landing and take off, particularly for the pilot in the left seat who was resonsible for aircraft control. For both left and right seats, the subjective assessment of stress rather than the subjective assessment of workload was significantly correlated with variation in heart rate. Frequencies of different types of communications varied significantly across segments of flight, however, they were not correlated with subjective ratings of workload. There was a significant difference between the left and right seats in the types of activities that contributed to their workload, however, workload was considered to be equivalent for the two. Author

A86-23749
PART-TRAINING STRATEGIES IN SIMULATED CARRIER LANDING FINAL APPROACH TRAINING
D. C. WIGHTMAN (U.S. Navy, Naval Training Equipment Center, Orlando, FL) and G. LINTERN (Essex Corp., Orlando, FL) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 1013-1017. refs

A transfer-of-training investigation of part-task training was conducted at the Navy's Visual Technology Research Simulator (VTRS). A task segmentation strategy (backward chaining) and a task simplification strategy (enhancement of the simulated aircraft's response to throttle adjustments) were tested. In addition, the subjects' motor-skill aptitude was assessed. Training under backward chaining produced better transfer to the criterion task than an equal number of training trails on the criterion task itself. An aptitude-by-treatment interaction indicated that the backward chaining method of training was particularly advantageous for low-aptitude subjects. The simplification strategy did not appear to enhance transfer. Author

A86-23772
SOME PROBLEMS IN FLIGHT MECHANICS WITH RESPECT TO FLIGHT SAFETY [NEKTERE OTAZKY MECHANIKY LETU VE VZTAHU K BEZPECNOSTI LETANI]
R. ORLITA Zpravodaj VZLU (ISSN 0044-5355), no. 5, 1985, p. 341-344. In Czech. refs

The role of human factors in flight-safety assurance is examined. It is noted that the adequate theoretical training of pilots is a significant component of accident prevention. B.J.

A86-24324
PERCEPTUAL-MOTOR COORDINATION AND ADAPTATION DURING LOCOMOTION - DETERMINANTS OF PRISM ADAPTATION IN HALL EXPOSURE
G. M. REDDING (Illinois State University, Normal) and B. WALLACE (Cleveland State University, OH) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 4, Oct. 1985, p. 320-330. refs (Contract NIH-1-RO3-MH-34383)

In the present examination of prismatic dispiacement adaptation under conditions involving locomotion in a hallway exposure, total prism adaptation was in general inversely related to the presence or absence of mental arithmetic, and the relative magnitude of visual proprioreceptive shift depended on the availability of visible sound sources. The results obtained are consistent with a model assuming that local adaptive response depends on the available capacity for establishing and maintaining coordinative linkage between discordant systems. By contrast, locus or adaptive recalibration depends on the direction of these coordinative linkages, discordance, and adaptation occurring in the guided system(s). O.C.

A86-24325
DUAL HEMISPHERIC PROCESSING IN A LETTER MATCHING TASK
J. CONEY (Murdoch University, Australia) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 4, Oct. 1985, p. 331-342. refs

An investigation is made of the claim that performance on recognition, detection, and matching tasks can be enhanced if stimuli are projected to both sides of the visual field rather than only to one, due to the distribution of perceptual processing between the hemispheres. In the present series of three experiments, it was noted that while lateral interference between adjacent stimuli was implicated, a strong residual effect ascribable to hemispheric mechanisms remained. A model based on parallel hemispheric decision processes appears to furnish a better account of the data than one based on the notion of distributed perceptual processing. O.C.

A86-24508
SOME PSYCHOLOGICAL ASPECTS OF AIR SICKNESS [QUELQUES REMARQUES SUR LES ASPECTS PSYCHOLOGIQUES DES MALAISES EN VOL]
J. R. GALLE-TESSONNEAU (Armee de l'Air, Centre Medical de Psychologie Clinique, Paris, France) and G. SOLIGNAC (Hopitaux des Armees; Centre Principal d'Expertise Medicale du Personnel Navigant, Paris, France) (Societe Francaise de Medecine des Armees, Seance de Medecine Aeronautique, Metz, France, June 19, 1985) Medecine Aeronautique et Spatiale, vol. 24, 4th Quarter, 1985, p. 237-239. In French.

Various psychological aspects of air sickness among pilots are discussed from the point of view of the doctor. The main concern of air sickness is its effect on the neuro-sensorial capacities and the alertness of a pilot, and therefore flight safety. A difficulty arises in that the symptoms are not the same and are not experienced equally by all pilots, and because some pilots do not report bouts of illness to avoid being declared unfit for flight duty. When a pilot does report a problem, the tendency is for the pilot to discount the seriousness of the symptoms. However, pilots often retain significant levels of anxiety at having experienced air sickness, and must be thoroughly convinced that the factors which brought on the sensations have been 'cured' and can be explained causally in clear and definite terms. If the onset of air sickeness corresponds with emotional trauma in a pilot's life, then the pilot must be reassigned or removed from flight duty entirely if the emotional charge persists. The psychiatric goal, in the latter case, is to help the pilot accept a compromise situation which will permit going on with his life. M.S.K.

A86-25654
THE FLIGHT SURGEON AND PSYCHIATRY - INTEREST AND SKILLS
R. J. URSANO (Uniformed Services University of the Health Sciences, Bethesda, MD) and W. G. JACKSON, JR. (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 126-130. refs

The effects of age, experience, and flight medicine training status on the attitude and psychiatric skills of the nonpsychiatrist flight surgeon are examined. Interest in psychiatry, self-assessed ability of psychiatric skill, and education needs are measured in 170 USAF physicians using multi-dimensional contingency tables and linear regression models. The data reveal that age and experience do not affect interest in psychiatry; however, training status has a negative impact on the physician's interest. Psychiatric skills are related to training status, age, and experience; the older fully-trained physician has more interest and knowledge in psychiatry. A need for further education is observed in physicians in-training but is unaffected by age and experience. I.F.

A86-25655
FLYING AND DANGER, JOY AND FEAR
D. R. JONES (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 131-136.

The emotional roots which motiviate a person to become a flier or to develop an anxiety about flying are discussed. Reasons for choosing a flying career and their effect on a person's motivation to fly are described. The knowledge and experience required by a flight surgeon in order to evaluate and treat fliers who experience fear of flying are examined; examples of fliers who develop phobias, psychosomatic symptoms, or a loss of self-confidence are presented. I.F.

A86-26011* Arizona State Univ., Tempe.
SUBJECTIVE WORKLOAD AND INDIVIDUAL DIFFERENCES IN INFORMATION PROCESSING ABILITIES
D. L. DAMOS (Arizona State University, Tempe) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 71-74. refs
(Contract NCC2-202)
(SAE PAPER 841491)

This paper describes several experiments examining the source of individual differences in the experience of mental workload. Three sources of such differences were examined: information processing abilities, timesharing abilities, and personality traits/behavior patterns. On the whole, there was little evidence that individual differences in information processing abilities or timesharing abilities are related to perceived differences in mental workload. However, individuals with strong Type A coronary prone behavior patterns differed in both single- and multiple-task performance from individuals who showed little evidence of such a pattern. Additionally, individuals with a strong Type A pattern showed some dissociation between objective performance and the experience of mental workload. Author

A86-26013
THE TRAINING AND CERTIFICATION OF THE GENERAL AVIATION PILOT
J. M. KOONCE (Massachusetts, University, Amherst) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 87-91. refs
(SAE PAPER 841468)

Some accident statistics of general aviation are presented, as well as training and certification processes of the general aviation pilots. The rate of fatal accidents per million of miles is 0.128 in general aviation, as compared to 0.013 for air carriers. The reasons for this relatively poor safety performance are discussed, the low admission standards for the students and the lack of standardization of the flight instructors given among the primary causes. Other contributing factors are thought to be acquisition of certain habits (such as not using the check list before each flight) and poor judgment, (together with the lack of training in judgment and lack of its definition in the test guides), as well as inadequate biennial flight review (BFR) testing. Tightening up of the BFRs and a requirement to identify the pilots who have failed a BFR test are among the recommended measures. I.S.

A86-26019* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
EFFECTS OF DIGITAL ALTIMETRY ON PILOT WORKLOAD
R. L. HARRIS, SR. (NASA, Langley Research Center, Hampton, VA) and B. J. GLOVER (Kentron International, Inc., Hampton, VA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 131-136. Previously announced in STAR as N86-13892.
(SAE PAPER 841489)

A series of VOR-DME instrument landing approaches was flown in the DC-9 full-workload simulator to compare pilot performance, scan behavior, and workload when using a computer-drum-pointer altimeter (CDPA) and a digital altimeter (DA). Six pilots executed two sets of instrument landing approaches, with a CDPA on one set and a DA on the other set. Pilot scanning parameters, flight performance, and subjective opinion data were evaluated. It is found that the processes of gathering information from the CDPA and the DA are different. The DA requires a higher mental workload than the CDPA for a VOR-DME type landing approach. Mental processing of altitude information after transitioning back to the attitude indicator is more evident with the DA than with the CDPA. E.A.K.

A86-26024
THE DECISION TO FLY
A. F. ZELLER IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 169-176.
(SAE PAPER 841613)

The decision to fly and the capacity to carry a flight to a successful termination involves a wide spectrum of background determinants. These range from considerations of the pilot as a physical being with specific potentials and limitations of body structure, mental ability and emotional capacities to the adequacy of learning related to a specific performance and the character and condition of the aircraft. Specific factors relevant to each of these categories is discussed including the psycho-social, physiological and pathological. Crucial to success is the pilot's self-critical judgement. There is a necessary tension between the ongoing activity of carrying out a positive decision to fly and the requirements for continual assessment of the situation. Author

A86-26033* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARING FOR THE UNEXPECTED - A PSYCHOLOGIST'S CASE FOR IMPROVED TRAINING
H. C. FOUSHEE (NASA, Ames Research Center, Moffett Field, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 249-254.

In the procedures designed to minimize human errors that lead to aircraft incidents, the improved human factor engineering and automation approaches must be supplemented by new training methods. Changes are suggested in the preprogrammed training principles which are currently based almost exclusively on the procedures-oriented environment, with insufficient training for cognitive processing and awareness. Use of the Line-Oriented Flight Training procedure, in which a training simulator is supplemented by a highly structured script or scenario to simulate the total line operational environment for the purpose of simultaneously training the entire flight crew, offers one way of providing pilots and other crewmembers with the experience of dealing with unexpected or stressful events. Of primary importance is maximal coordination between the aircraft captain and other crewmembers during the flight, which puts emphasis on the importance of teamwork and personal relations among all other crewmembers. The current FARs governing training and proficiency will have to be modified to accommodate new training appoaches. I.S.

A86-26293
THE EFFECTS OF THE CONTRAST, SPATIAL FREQUENCY, AND TEMPORAL FREQUENCY OF A SURROUNDING FIELD UPON THE DETECTION THRESHOLDS OF GRATINGS
A. BOWLING (Monash University, Clayton, Australia) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 387-391. refs

Three experiments, in which the temporal and spatial characteristics of square-wave gratings surrounding a central test field were varied, are reported. The detection thresholds of 1-sec presentations of a 5-Hz counterphase flickering .5-cycle/deg (cpd) sinusoidal grating were measured under the different surround conditions. Threshold was found to increase with increasing surround contrast, and to be confined to surround spatial frequencies of 2 cpd and below. Maximum threshold elevation occurred with surround drift frequencies at about 8 Hz, irrespective of spatial frequency. It was concluded that the surround effect is probably due to an inhibitory interaction between transient-type mechanisms in the central visual field and the periphery. Author

A86-26294
SENSITIVITY TO PHASE DISTORTIONS IN CENTRAL AND PERIPHERAL VISION
L. O. HARVEY, JR., I. RENTSCHLER, and C. WEISS (Muenchen, Universitaet, Munich, West Germany) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 392-396. Research supported by the Fraunhofer-Gesellschaft and Alexander von Humboldt Stiftung. refs
(Contract NIH-RR-07013-78)

Sensitivity to phase quantization of a two-dimensional random texture pattern was determined for central and peripheral vision, using the phase-quantization paradigm of Caelli and Bevan (1982). The random texture was quantized with two-octave-wide bands centered on spatial frequencies of 2, 4, 8, and 16 cycles per degree (cpd). Six phase-distorted versions of the original texture were prepared for each of these bands, and the amount of stimulus contrast required for threshold discrimination between the original and the phase-distorted textures for each stimulus pair was determined at two exposure durations, 125 and 1000 msec. Maximum sensitivity to phase quantization was found in the 4 cpd spatial frequency band. Increasing the duration of exposure increased sensitivity. Compared with foveal viewing, a pronounced loss of sensitivity to phase quantization was found with 2 deg peripheral viewing. I.S.

A86-26295
SUPRATHRESHOLD CONTRAST PERCEPTION AS A FUNCTION OF SPATIAL FREQUENCY
P. C. QUINN (Brown University, Providence, RI) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 408-414. refs
(Contract NIH-EY-03524)

The effect of spatial frequency on the functional relationship between perceived contrast and physical contrast (particularly on the effect on the exponent of the function) was examined after controlling possible artifactual effects such as the failure to account for range and stimulus repetition effects and the contrast threshold difference. Using a modulus-free version of magnitude estimation, judgments of perceived contrast were obtained from 7 subjects at spatial frequencies of 0.75, 4, 15, and 18 cycles per degree. When the data were fit with a threshold-corrected power function, an increase in the exponent of the perceived physical contrast function was observed at both low and high spatial frequencies, relative to a middle spatial frequency. The results agree with the study of Franzen and Berkley, (1975) and are in contrast to that of Gottesman et al. (1981). I.S.

A86-26296
OVERALL SIMILARITY AND THE IDENTIFICATION OF SEPARABLE-DIMENSION STIMULI - A CHOICE MODEL ANALYSIS
R. NOSOFSKY (Indiana University, Bloomington) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 415-432. refs
(Contract NSF BNS-80-26656; NIH-MH-37208; NIH-RR-07031)

Various restricted versions of the similarity choice model (Luce, 1963; Shepard, 1957) were used to analyze data on identification by two subjects of a set of perceptually confusable stimuli varying along two continuous, separable dimensions. In the main model version, application of the multidimensional scaling approach to modeling similarity yielded excellent quantitative accounts of the data. A surprising result was that the Euclidean metric provided a far better description of psychological distance relationships than the city-block metric, a finding that contrasts with all previous conclusions regarding the appropriate Minkowski r-metric for separable-dimension stimuli. Possible reasons for this discrepancy were considered, examining Shepard's (1964) seminal study in depth. I.S.

A86-26297
A PURELY CENTRAL MOVEMENT AFTEREFFECT INDUCED BY BINOCULAR VIEWING OF DYNAMIC VISUAL NOISE
Y. Y. ZEEVI (MIT, Cambridge, MA) and G. A. GERI (Dayton University, Williams AFB, AZ) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 433-437. refs
(Contract F33615-81-K-0011)

Observers viewed dynamic visual noise binocularly with a neutral density filter placed over the right eye. Twelve of 13 observers perceived depth and coherent motion of two counterdirectional distributions of dot-planes. Three of the 12 observers saw one plane as much more distinct than the others; thus, for those observers, that dot-plane could be used as a form-free central movement stimulus. Sudden removal of the neutral density filter resulted in a short-lived movement aftereffect (MAE). The magnitude of the purely central MAE, unlike those of classical MAEs, was independent of both the magnitude and the time spent viewing the inducing movement. These results suggest a distinction between the purely central MAE reported here and the central (binocular) MAEs induced by stimulus movement on the retina. Author

A86-26298
SUPPRESSION OF VISIBLE PERSISTENCE IN APPARENT MOTION
J. H. HOGBEN (Western Australia, University, Nedlands, Australia) and V. DI LOLLO (Alberta, University, Edmonton, Canada) Perception and Psychophysics (ISSN 0031-5117), vol. 38, Nov. 1985, p. 450-460. refs
(Contract NSERC-A-6592)

Moving stimuli produce less smear than would be expected on the basis of visible persistence lasting 100-150 msec. Two experiments examined the duration of smear as a function of background luminance, target velocity, and duration of the display. It was found that smear decreased as background luminance increased, smear increased with velocity, and, as display duration increased from 10 to 160 msec, duration of smear first increased and then decreased. Alternative explanations of the results are considered. It is suggested that smear is actively suppressed by stimulus-initiated inhibitory processes. Author

N86-18980# Naval Aerospace Medical Research Lab., Pensacola, Fla.
A COMPARISON OF DICHOTIC LISTENING TASK SCORING METHODS
G. R. GRIFFIN and J. D. MOSKO Mar. 1985 19 p
(Contract M00-96)
(AD-A159920; NAMRL-SR-85-4) Avail: NTIS HC A02/MF A01 CSCL 05J

In a recent evaluation of two dichotic listening tasks (DLTs) as predictors of performance in Naval Aviation Undergraduate Pilot Training, results based on one of five scoring methods were presented. The purpose of this report is to provide DLT performance scores using all five scoring methods for comparative purposes to determine the scoring system most economical and efficient for automated scoring and, most sensitive to individual and mean differences. Five scoring methods are described which vary primarily in their treatments of errors, and in their consideration of the importance of sequence effects. Five independent analyses of previously reported data were performed. Results were nearly invariant across all five methods; i.e., intercorrelations among scores across scoring techniques exceeded 0.90. Two of the scoring methods are recommended for purposes of standardizing future analyses of DLT performance, one because of its simplicity and ease of application and the other, because it may have greater sensitivity to differences in individual performance. GRA

N86-18981# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECTS OF BIMODAL PRESENTATION OF STIMULI AND NOISE ON TARGET DETECTION Interim Report
L. J. LEWANDOWSKI and D. A. KOBUS 1 Aug. 1985 13 p
(AD-A160122; NSMRL-1058) Avail: NTIS HC A02/MF A01
CSCL 17D

Twenty men are presented background noise and target stimuli in either the visual or auditory modality, or in both at once. Auditory and visual detection thresholds were lowest when functionally redundant targets were presented simultaneously in both modalities. It appeared that two redundant signals collectively improved sensitivity and reduced uncertainty regarding a choice response, thus enabling a reduction in detection threshold. Detection threshold to a single target was not negatively affected when attention was divided between two modalities and noise presented in both. The finding of improved detection in each modality of the bimodal condition is consistent with the coactivation explanation of bimodal facilitation and supports the advantage of a bimodal input approach in tasks such as sonar, radar, and air traffic control. GRA

N86-18982# Army Research Inst. for the Behavioral and Social Sciences, Alexandria, Va.
PHYSICAL FITNESS AS A MODERATOR OF COGNITIVE WORK CAPACITY AND FATIGUE ONSET UNDER SUSTAINED COMBAT-LIKE OPERATIONS Technical Report, Aug. 1982 - Mar. 1983
R. J. PLEBAN, D. A. THOMAS, and H. L. THOMPSON Jun. 1985 20 p
(Contract DA PROJ. 2Q1-62717-A-790)
(AD-A160417; ARI-TR-687) Avail: NTIS HC A02/MF A01
CSCL 06N

A study was devised to investigate the role of physical fitness in moderating both cognitive work capacity and fatigue onset under sustained combat operations. Sixteen male ROTC cadets were followed through a two-and-a-half-day Pre Ranger Evaluation exercise. Prior to the actual start of the exercise the cadets' overall level of physical fitness was assessed by using five fitness indices (Harvard Step Test, chinups, pushups, situps, and two-mile run). Cognitive performance and subjective measures of fatigue state were assessed at regular intervals before, during, and one day after the exercise. The results suggest that fitness may attenuate decrements in cognitive work capacity for certain tasks requiring prolonged mental effort, particularly as the cumulative effects of sleep loss and other stressors begin to mount. Similarly, the results of this study suggest that as overall stress levels increase, fitness may have a beneficial effect in moderating fatigue rate. Fitness did not significantly enhance the recovery process with respect to cognitive work capacity, and actually appeared to hinder recovery from fatigue. GRA

N86-18983# Dunlap and Associates, Inc., Norwalk, Conn.
SYSTEM DEVELOPMENT AND EVALUATION TECHNOLOGY: STATE OF THE ART OF MANNED SYSTEM MEASUREMENT Final Report, 1980 - 1982
J. M. EDWARDS, R. F. BLOOM, and P. A. BRAININ Feb. 1985 65 p
(Contract MDA903-80-C-0345; DA PROJ. 2Q2-63743-A-794)
(AD-A160418; REPT-293-8; ARI-RN-85-20) Avail: NTIS HC A05/MF A01 CSCL 05H

This report is an up-to-date assessment of the state of the art of manned system measurement. The assessment is based in part on the material presented in the Task 3a report-Review of Manned System Measurement Literature. This report employs a topic outline compatible with the overall measurement model being developed under the present contract. The model is sufficiently representative and comprehensive so that all significant comments and authors have a place in its structure. One of the important uses of this report is the identification of current measurement capabilities and limitations, so that requirements and priorities for the improvement of system-oriented measurement can be delineated. In this review, it became apparent, for example, that measurement models need to be further developed, supported with appropriate human performance data, refined through more consistent and comprehensive applications, and validated by independent corroborations of some kind. Futhermore, the general sense of impracticality, and the need for simplifying assumptions in some cases, strongly suggests a requirement for improving the efficiency of measurement models by reducing the magnitude of effort required in their application. It is envisioned that much time, effort, and money can be saved, irrelevant measurements can be avcided, meaningfulness and utility can be enhanced, and additional applications of the models can be found if several key improvements are made. GRA

N86-18984# Naval Submarine Medical Research Lab., Groton, Conn.
MULTIMODAL VERSUS UNIMODAL INFORMATION PROCESSING OF WORDS Interim Report
L. J. LEWANDOWSKI, S. HURSH, and D. A. KOBUS 29 Jul. 1985 14 p
(AD-A160517; NSMRL-1056) Avail: NTIS HC A02/MF A01
CSCL 17A

Sonarmen are constantly confronted with information presented simultaneously through different sensory modalities. Verbal information is one type of input to which they are exposed. Little is known regarding the effect of undirected attention when verbal information is presented simultaneously to the auditory and visual modality. The question of interest is how to unimodal and multimodal presentation conditions differentially affect performance? The superiority of any particular modality depends upon the task requirements, response demands and the complexity of the stimuli. Multimodal stimulation facilities the RT of the slower unimodal presentation while providing little if any facilitates to the faster unimodal approach. Sonarmen are exposed to various types of information. Reports of this study and previous studies have shown that the results are task dependent. Therefore, it is important to determine how different types of stimuli interact with modes of presentation and affect sonar performance. GRA

N86-18985# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
BEYOND ASSOCIATIONS: STRATEGIC COMPONENTS IN MEMORY RETRIEVAL Technical Report, Jun. 1983 - Jul. 1985
L. M. REDER 3 Oct. 1985 44 p
(Contract N00014-84-K-0063; NSF BNS-03711; RR0-4206)
(AD-A160783; TR-85-3-ONR) Avail: NTIS HC A03/MF A01
CSCL 05J

There are two dominant approaches to understanding human memory, one in the tradition of Ebbinghaus, the other in the tradition of Bartlett. The former approach views learning as the formation of associations, while in the latter views memory as the process of reconstruction of fragments based on prior knowledge. These positions are often considered antithetical: Ebbinghaus was concerned with laws of memory and tried to control for prior knowledge; Bartlett was concerned with how our world knowledge interacts with learning and memory. This paper argues that one can collect data that supports either position because people can adopt one of several memory strategies. Data are reviewed that ilustrate that the same knowledge structure can produce dramatically different results, depending on the strategies that operate on that structure. Author (GRA)

N86-18986# Tennessee Univ., Knoxville. Dept. of Psychology.
PLAUSIBILITY FUNCTIONS OF IOWA VOCABULARY TEST ITEMS ESTIMATED BY THE SIMPLE SUM PROCEDURE OF THE CONDITIONAL P.D.F. APPROACH
F. SAMEJIMA Dec. 1984 198 p
(Contract N00014-81-C-0569)
(AD-A160850; RR-84-1-ONR) Avail: NTIS HC A09/MF A01
CSCL 05J

Simple Sum Procedure of the Conditional P.D.F. Approach was applied for estimating the plausibility functions of the distractors of the Iowa Vocabulary Test items. In so doing, the normal ogive model was adopted for the correct answers of those items, and

those items were used as the substitute for the old test. The group of subjects consists of 2,364 students who took the Level 11 tests in 1971 through 1977. The results indicate the existence of informative distractors for certain test items. The model validation study accompanied to it indicates that for most items the normal ogive model is suitable. GRA

N86-18987# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.

AN INVESTIGATION INTO EFFECTS OF ENVIRONMENTAL CHANGES ON LOCUS OF CONTROL M.S. Thesis

S. A. ANSWAY Sep. 1985 66 p

(AD-A160861; AFIT/GLM/LSB/85S-2) Avail: NTIS HC A04/MF A01 CSCL 05J

Past research suggest that relationships exist between Type A personality, stress, and coronary heart disease. This thesis determined that Type A individuals are inclined to experience more stress than Type B individuals in similar situations. A relationship was found between Type A behavior and internal locus of control indicating that individuals with internal locus of control are more likely to be Type A personalities than type B personalities. Relationships were also found among Type A behavior, internal locus of control, and assertiveness indicating that Type A individuals are more assertive than Type B individuals. Family inventory was inversely related to locus of control inferring that internal locus of control individuals are more satisfied with their personal relationships than are external locus of control individuals. Because family inventory was also inversely related to stress, when stress is present in one area of an internal locus of control individuals's life, the individual looks to other areas of his life for satisfaction. No relationship was found between stress and assertiveness indicating that assertive individuals deal more effectively with stressful situations. This investigation also determined that as the environment changes to a more structured rigid environment, the individual shifts from an internal to an external locus of control. These determinations were based on statistical analysis using Pearson Correlations, Paired t-Tests, and Regression Analysis.

Author (GRA)

N86-19896# Naval Aerospace Medical Research Lab., Pensacola, Fla.

SIMPLE AND CHOICE REACTION TIME IN A SECONDARY TASK UNDER VARIED STIMULUS MODALITY PROBABILITIES Interim Report

D. K. MCBRIDE, L. S. GOODMAN, and J. M. OWENS Feb. 1985 12 p

(AD-A159698; NAMRL-1313) Avail: NTIS HC A02/MF A01 CSCL 05J

Most investigations of attention and attention allocation have been limited to assessments of attention shifting among stimuli simultaneously presented within a single sensory modality. The construct of attention, however, is generally conceptualized as the process which determines the selection of sensory information from all potential sources, among all potential modalities. Although limited in relevance to more real-world, high demand task situations, many of the findings and interpretations from single modality attention studies provide an important theoretical basis for performance assessment in complex task environments requiring multimodal processing. The objective of the present research was to directly assess attention allocation in tasks requiring both visual and auditory information processing. In the present study, modality uncertainty was reduced by experimentally manipulating the probability of stimulus occurrence within a given modality. Furthermore, responding in the present experiment required choice as well as simple reaction, and the responses were made jointly with the continuous execution of a three-axis, compensatory tracking task. As expected, simple and choice reaction times to auditory signals were faster than were those to visual signals.

GRA

N86-19897# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

EVALUATION OF A MULTI-METHOD GROUP TREATMENT APPROACH FOR THE MANAGEMENT OF STRESS Ph.D. Thesis

S. H. TALLANT 1985 322 p

(AD-A160813; AFIT/CI/NR-85-118D) Avail: NTIS HC A14/MF A01 CSCL 05J

The treatment effectiveness of a stress management package is evaluated. The role of social support as a significant external factor in reducing stress symptomatology is then discussed. It is hypothesized that subjects receiving treatment would obtain significantly greater decreases in stress than subjects in a waiting list condition. Also, it is hypothesized that wait-list subjects with high levels of social support would obtain significant greater decreases in stress than wait-list subjects with low levels of social support. A matched-pair randomized block design is used. Thirty-two subjects are rank ordered on a measure of social support, matched according to level of social support, and randomized into either treatment or wait-list condition. The statistical and clinical results demonstrate the contribution of the stress management package in reducing stress when compared to no treatment intervention.

GRA

N86-19898# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

AN INVESTIGATION INTO PEER AND SUPERVISOR DIFFERENCES IN THE OBSERVATION OF PERFORMANCE-RELATED BEHAVIORS M.S. Thesis

M. W. DALEY Dec. 1985 46 p

(AD-A160819; AFIT/CI/NR-85-132T) Avail: NTIS HC A03/MF A01 CSCL 05I

Differences between peer and supervisors with respect to the observation of performance-related behaviors using the Instanteneous Report of Judgments (IRJ) technique are examined. Undergraduate students and graduate teaching assistants served as peer and supervisor subjects respectively. All subjects viewed a videotape of an undergraduate giving a major classroom oral presentation. It was hypothesized that peer and supervisor subjects would differentially observe imbedded incidents due to their different role relationships to the presenter. The results indicate partial support for the hypothesis, with supervisor subjects observing significantly more critical incidents. An alternative interpretation for the results, that of rater expertise, is forwarded and discussed. Directions for future research in the area of cognitive processes and performance appraisal are discussed. GRA

N86-19899# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.

THE CLINICAL PREDICTION OF DANGEROUSNESS Ph.D. Thesis

E. R. WILLIAMS May 1985 119 p

(AD-A160820; AFIT/CI/NR-85-133D) Avail: NTIS HC A06/MF A01 CSCL 05J

The failure to accurately predict violent potential in psychiatric patients is currently an area of popular and professional interest. Virtually all studies have shown psychological testing to be a poor predictor of violence. The present investigation utilized typed vignettes which described a brief, fictionalized interview as an analog to an actual contact with a patient. A recent history of violence (an actuarial factor), support by a caring person (an environmental factor), and psychological testing information were systematically manipulated among the vignettes. Vignettes were mailed to psychiatrists in California who are asked to rate dangerousness and to decide if emergency hospitalization was required for the fictionalized patient. Each psychiatrist received one of 16 possible vignettes. Statistical analyses were utilized to determine how the three manipulated variables actually influenced professional decision making, and these results were compared with what factors the psychiatrists said influenced them. Psychological testing exerts a powerful but unwarranted, and possible unconscious, influence on the judgmental process.

GRA

N86-19900# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
MESOLIMBIC AND NIGROSTRIATAL DOPAMINERGIC SYSTEMS: BEHAVIORAL NEUROPHARMACOLOGY Ph.D. Thesis
S. L. HARTGRAVES Aug. 1985 150 p
(AD-A160821; AFIT/CI/NR-85-134D) Avail: NTIS HC A07/MF A01 CSCL 06O

Drug-induced behaviors associated with the nucleus acumbens and striatum are examined. The use of 6-Hydroxydopamine to anatomically enhance a behavior emanating from one of the above structures (by allowing doses of drugs low enough to prevent major behavioral competition from the other) was only partially successful. Thus, locomotor hyperactivity and circling were enhanced by 6-OHDA-induced lesions of the nucleus accumbens and the medial forebrain bundle, respectively. Bilateral lesions of the striatum did not result in simple enhancement of stereotypic behavior, but instead caused a unique, self-directed behavior termed stereotypic grooming. Competition between the nucleus accumbens and the striatum for behavioral expression was evident in most of these studies. GRA

N86-19901# Chicago Univ., Ill. Center for Decision Research.
A MODEL OF THE CONJUNCTION FALLACY
H. J. EINHORN Jun. 1985 26 p
(Contract N00014-84-C-0018)
(AD-A160876; TR-15) Avail: NTIS HC A03/MF A01 CSCL 05J

Tversky & Kahneman show that both sophisticated and naive people, in many different substantive problems, often judge the conjunction of events to be larger than one of its components (hereafter called a single violation). Furthermore, for some problems, people judge the conjunction as larger than both of its components (a double violation). The purpose of this document is to propose a quantitative model of how people judge the probability of conjunctive events. The advantage of the model is that it makes specific predictions as to when conjunction fallacies of different types will or will not occur. Moreover, the model is naturally extended to deal with conjunctive explanations for events. The conjunction fallacy occurs when the judged probability of a conjunctive event is larger than the probability of one (or more) of its constituents. A model of this phenomenon is proposed in which the judged conjunctive probability is a weighted geometric average of the component probabilities, where the weights reflect the representativeness of the components. The model generalizes to the case where the events involve a casual or correlational link, and, to the use of conjunctive explanations of an event. In all three situations, the model specifies the conditions under which different degrees of the fallacy will or will not occur. GRA

N86-19902# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
ON THE ANALYSIS AND DESIGN OF HUMAN INFORMATION PROCESSING ORGANIZATIONS
K. L. BOETTCHER and R. R. TENNEY Oct. 1985 6 p
(Contract N00014-77-C-0532; N00014-84-K-0519)
(AD-A161015; AD-F620003; LIDS-P-1503) Avail: NTIS HC A02/MF A01 CSCL 05J

The design of human organizations where members perform routine tasks under the pressure of time is considered. A three-phase approach is outlined. In the first phase, normative decision rules that specify ideal human behavior are obtained. In the second phase, implementations of these decision rules are devised, and descriptions of actual human behavior and workload are developed. Finally a third phase integrates design elements by placing parameters of the implementations for best organization performance, subject to individual member workload limitations. To illustrate the approach, a specific design problem is considered. Author (GRA)

N86-19903# Essex Corp., Orlando, Fla.
AN ANALYSIS OF VISUAL TASKS IN HELICOPTER SHIPBOARD LANDING Final Technical Report, Sep. 1981 - Apr. 1985
K. S. BERBAUM and R. S. KENNEDY 1 Nov. 1985 62 p
(Contract N61339-81-C-0105)
(AD-A161101; EOTR-85-7) Avail: NTIS HC A04/MF A01 CSCL 05H

The purpose of this research effort was to identify visual research issues concerning helicopter landings, particularly the hover phase, for future study in the Visual Technology Research Simulator (VTRS) program. Identification of salient visual issues is a step toward surfacing equipment features that can be modified and studied. As we discussed the task with pilots, reviewed NATOPS manuals, and simulations witnessed, it became apparent that the visual task may differ depending upon whether: experienced or inexperienced pilots are flying; a simulator or an aircraft is flown; the environment is day or night; the pilot sought to acquire or maintain a skill level. As a way of limiting this broad project, it was elected to review intensively a scenario involving a highly experienced operator flying dusk/night approaches in a simulator. The Naval aviator selected was prompted by another aviator more familiar with the objective who dictated verbal protocols of his visual and control activities during several landings. These protocols were sorted into 10 phases in order to correspond to increasing distances in the landing task and the visual information processing within each stage was described. Therefore, the stages are delimited in terms of range or altitude from the ship. We believe the most useful outcome of this analysis will be a list of visual cue augmentations that may be implemented and studied over the various stages of landing. GRA

N86-19904# Brown Univ., Providence, R. I. Center for Neural Science.
LOCAL AND GLOBAL FACTORS IN LEARNING
L. N. COOPER 6 Nov. 1985 42 p
(AD-A161128; TR-28) Avail: NTIS HC A03/MF A01 CSCL 05J

Recent progress in the interaction of theoretical ideas and experimental results that relate to learning and memory is discussed. Consideration is given, in particular, to the effects of the neurotransmitters GABA, Norepinephrine and Acetylcholine on the development of circuitry in visual cortex. That most intriguing aspect of human memory is that: its persistence in spite of continual loss of individual neurons over the lifetime of the individual has led many workers to the concept of distributed memory. For a distributed memory (more like a hologram than a photograph) possesses in a very natural way the property of relative invulnerability to the loss of storage units. Individual memory sites hold superimposed information concerning many events. We can make complex decisions in small parts of a second. This suggests very strongly that there is much parallel processing in the brain - an idea that is almost obvious on inspection of component such as the retina. It is now commonly thought that the synaptic junction may be a means to store information (memory, for example) as well as to transmit it from neuron to neuron. GRA

N86-19905# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
THE INFLUENCE OF QUALITY CIRCLES ON ATTITUDINAL OUTCOMES AMONG CIVIL ENGINEERING PERSONNEL M.S. Thesis
A. E. THAL, JR. Sep. 1985 29 p
(AD-A161152; AFIT/GEM/LSB/85S-21) Avail: NTIS HC A03/MF A01 CSCL 13B

This thesis investigated the influence of QCs on various satisfaction levels among Air Force civil engineering personnel with the objective being to determine whether a relationship exists between QC membership and an employee's level of satisfaction/morale. Surveys were mailed to a sample of QC members and nonmembers working in civil engineering squadrons at five different bases. Statistical analysis consisted of reliability estimation, Pearson correlation, and Student's t-tests. The results of this research indicated that there were significant differences between QC members and nonmembers on two variables:

self-ratings of both job performance and job effort. In fact, it appeared that QC members scored lower, but not significantly lower, on many of the variables. The many weaknesses inherent in this study suggest that these results are tentative, at best. Four tenable explanations for the results are given. If QCs are to be increasingly used by the government, further research into the outcomes of the QC process are warranted. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-23424
DUTY-CYCLE ANALYSIS OF A HUMAN-CONTROLLED MANIPULATOR
R. S. STOUGHTON (Tennessee, University, Knoxville) and H. L. MARTIN (Oak Ridge National Laboratory, TN) Journal of Robotic Systems (ISSN 0741-2223), vol. 2, Winter 1985, p. 473-499. refs
(Contract DE-AC05-84OR-21400)

The duty cycles of a human-controlled servomanipulator system have been experimentally measured revealing how humans use manipulators to perform tasks. The use of the kinematic ranges, in both joint and Cartesian space is valuable to engineers in the kinematic design of servomanipulators. The working volume of human manipulation presented here is also of interest to designers of prosthetic systems. These results illuminate the relative merits of various system drive configurations. A graphical representation of mechanical power usage, which displays the total operation time as a function of torque and vulocity, is presented for each manipulator joint. These data are compared with data representing idealized joint performance resulting in design criteria for quantitative improvements in joint torque and velocity capacities. A generalized method for applying this representation to any robotic system is discussed. Author

A86-23505* Technology, Inc., San Antonio, Tex.
MINIMUM PRESSURE FOR A ZERO-PREBREATHE PRESSURE SUIT
R. W. KRUTZ, JR. (Technology, Inc., San Antonio, TX), G. A. DIXON (USAF, School of Aerospace Medicine, Brooks AFB, TX), and W. T. HARVEY (Lockheed Missiles and Space Co. Inc., Sunnyvale, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 5 p. refs
(Contract NASA ORDER T-82170)
(SAE PAPER 851315)

There are two current approaches to reducing the risk of decompression sickness during repeated extravehicular activity (EVA) without prebreathing 100 percent oxygen. One approach suggests the use of different pressures in the transfer vehicle, the station, and the suit. The other would use advanced pressure-suit technology to build a suit that will make different pressures unnecessary provided the bends-free suit pressure is reasonable and can be readily determined. Research at the USAF School of Aerospace Medicine since November 1982 has been directed at determining this suit pressure using human subjects at simulated altitudes of 16,500 to 10,000 feet (7.8 to 10 psia). An earlier report of this ongoing research showed that bends is not totally eliminated at 7.8 psia. The present study is a continuation of this effort to define a 'bends-free' suit pressure with the initial results suggesting that this pressure begins at around 9.5 psia (from a 14.7 psia station). Author

A86-23521
THE ROLES OF ASTRONAUTS AND MACHINES FOR FUTURE SPACE OPERATIONS
R. H. SCHAEFER, R. E. OLSEN, and F. J. ABELES (Grumman Aerospace Corp., Bethpage, NY) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p.
(SAE PAPER 851332)

A comparative assessment is made of remote operation space environment systems and human EVAs, with a view to future space missions, both individually and in combination. The tasks in question encompass servicing and construction operations on manned space station and unmanned platforms. Laboratory tests and simulations of representative remote system and EVA task performance are discussed and recommendations for additional development activities are presented. O.C.

A86-23522
EVOLUTION OF THE SHUTTLE EXTRAVEHICULAR MOBILITY UNIT'S LIFE SUPPORT SYSTEM
F. H. GREENWOOD and R. J. BALINSKAS (United Technologies Corp., Hamilton Standard Div., Windsor Locus, CT) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 11 p.
(SAE PAPER 85-1333)

The philosophy, design, and operation of the Shuttle Extravehicular Mobility Unit (EMU) Block I and Block II are discussed, stressing details of the life support system (LSS). Besides the need to meet performance requirements in environmental extremes, the major design considerations of the LSS were size and weight restrictions, and maintainability. The liquid cooling and ventilation garment (LCVG) contains tubes of cooling water and has ventilation ducting to return O2, CO2, and humidity to the LSS for purification, cooling, and recirculation. The primary life support subsystem (PLSS) mounted on the back of the hard upper torso (HUT) of the space suit assembly (SSA) includes the primary oxygen bottles, three storage tanks of water for heat rejection, the fan/separator/pump assembly, the heat rejection sublimator, the contaminant control cartridge, and a caution and warning system computer to monitor the LSS. A display and control module gives the computer readout and has manual control of the LCVG water temperature. Innovations in the Block II design resulted in reduced maintenance and a fourteen-fold increase in the mean time between failures. Detailed schematics are included. R.R.

A86-23523* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
YOUR SPACE SUIT AND YOU - SIGNIFICANCE OF MANLOADING IN PRESSURE SUIT DESIGN
M. ROUEN (NASA, Johnson Space Center, Houston, TX) and R. GRAY (ILC Industries, Inc., ILC Dover Div., Frederica, DE) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 15 p. refs
(SAE PAPER 851334)

Data collection on man-induced loads borne by space suits is discussed, with emphasis on the glove area. The distinction between the 'potential' maximum manload (measured according to the 95 percentile male outside the suit), and the actual manload experienced by the suit or 'limit manload', is stressed. Limit manload data for the glove were collected using a glove with finger and metacarpal joints and a hard shell to support strain gages. Potential manload data are theorized to exceed the limit manload (as corroborated by entire suit limit load data presented for the Apollo and Shuttle suits) because of load sharing within the fabric configuration, test inputs being at values other than 95 percentile values, and the restraint line acting like a spring and preventing the load from being induced. This, however, is not borne out by the glove test data, illustrating the difficulty of measuring the man/machine interface. Design load is determined by adding he pressure load and the limit load after compensations have been

made for load splitting. Finally, a method for better testing, used in the design of an improved mobility glove for the Space Shuttle program, is presented. R.R.

A86-23524
ENHANCEMENT OF SPACE SUIT GLOVE PERFORMANCE
H. C. WRIGHT, III (ILC Industries, Inc., ILC Dover Div., Frederica, DE) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 18 p.
(SAE PAPER 851335)

Space suit glove design from the Apollo program to the present day is detailed. The low operating pressure of the Apollo and Shuttle suits makes possible the fabrication of gloves from 'softgoods' (fabrics and dipped urethanes). Both systems have identical joint motions, accommodated for in the digits by softgoods material, and in the wrist by supporting hardware with the aid of bearings mounted in a disconnect coupling. The Apollo glove consisted of a custom-molded integral bladder/restraint forming the pressure retaining and loadbearing element, a Neoprene/Latex sheath adding protection of the other elements, and an outer Thermal Garment (TMG) for thermal and abrasion/puncture protection. Different material, a separate removable bladder, pleats on the backs of TMG digits, and less abrasion and thermal protection in the Shuttle Baseline Glove resulted in better structural integrity and ease of production without compromising mobility. In the Shuttle Modified glove from 1985 on, a new bladder material eliminated its predecessor's problem of hydrolysis; increased pleating contributed to a 30 percent reduction in digit joint torque; and digit adjustment capability reduced the numer of projected custom gloves due to poor size fitting. Future developments will focus on mobility and the needs of the Space Station program. Glove schematics are included. R.R.

A86-23526
STATIC FEED WATER ELECTROLYSIS SYSTEM FOR SPACE STATION O2 AND H2 GENERATION
J. T. LARKINS and A. J. KOVACH (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851339)

The development of a three-person O2 generation system based upon the static feed water electrolysis (SFWE) concept is analyzed. A 30-cell electrolysis module, which is capable of producing 2.50 kg/day of O2 for metabolic use, 1.18 kg/day for CO2 removal, and 0.24 kg/day to compensate for overboard leakage, is designed. The electrochemical reaction which occurs in the water electrolysis cell, and the operation of the cell are examined. The three additional components of the oxygen generation system, the coolant control assembly, the three-fluids pressure controller, and the fluid control assembly, are described. The endurance testing of the components of the SFWE system is studied. The SFWE cell size optimization based on calculating total equivalent weight in terms power penalty is investigated. A SFWE system design for the Space Station is proposed. I.F.

A86-23527* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
DEVELOPMENT STATUS OF REGENERABLE SOLID AMINE CO2 CONTROL SYSTEMS
A. K. COLLING, JR., T. A. NALETTE (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT), R. J. CUSICK (NASA, Johnson Space Center, Houston, TX), and R. P. REYSA (Boeing Aerospace Co., Seattle, WA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(Contract NAS9-13624; NAS9-16978)
(SAE PAPER 85-1340)

The development history of solid amine/water desorbed (SAWD) CO2 control systems is reviewed. The design of the preprototype SAWD I CO2 system on the basis of a three-man metabolic load at the 3.8 mm Hg ambient CO2 level, and the functions of the CO2 removal, CO2 storage/delivery, controller, and life test laboratory support packages are described. The development of a full-scale multiple canister SAWD II preprototype system, which is capable of conducting the CO2 removal/concentration function in a closed-loop atmosphere revitalization system during zero-gravity operation, is examined. The operation of the SAWD II system, including the absorption and desorption cycles, is analyzed. A reduction in the thermal mass of the canister and the system's energy transfer technique result in efficient energy use. The polyether foam, nylon felt, nickel foam, spring retained, and metal bellows bed tests performed to determine the design of the zero-gravity canister are studied; metal bellows are selected for the canister's configuration. I.F.

A86-23528* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ELECTROCHEMICAL CO2 CONCENTRATION FOR THE SPACE STATION PROGRAM
N. LANCE (NASA, Johnson Space Center, Houston, TX), M. SCHWARTZ (NASA, Ames Research Center, Moffett Field, CA), and R. B. BOYDA AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(SAE PAPER 851341)

Under the sponsorship of NASA, Electrochemical Carbon Dioxide (CO2) Concentration EDC technology has been developed that removes CO2 continuously or cyclically from low CO2 partial pressure (400 Pa) atmospheres with the performance and operating characteristics required for Space Station applications. The most recent advancement of this technology is the development of an advanced preprototype subsystem, the CS-3A, to remove the metabolic CO2 produced by three persons from the projected Space Station atmosphere. This paper provides an overview of EDC technology, shows how it is ideally suited for Space Station application, and presents technology enhancements that will be demonstrated by the CS-3A subsystem development program. Author

A86-23529* Hamilton Standard Div., United Aircraft Corp., Windsor Locks, Conn.
INITIAL DEVELOPMENT AND PERFORMANCE EVALUATION OF A PROCESS FOR FORMATION OF DENSE CARBON BY PYROLYSIS OF METHANE
G. P. NOYES (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and R. J. CUSICK (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p. refs
(SAE PAPER 851342)

The three steps in pyrolytic carbon formation are: (1) gaseous hydrocarbon polymerization and aromatic formation; (2) gas-phase condensation and surface adsorption/impingement of polyaromatic hydrocarbon; and (3) final dehydration to carbon. The structure of the carbon in the various stages of formation is examined. The apparatuses and experimental procedures for the pyrolysis of methane in a 60 cm long quartz reactor tube at temperatures ranging from 1400-1600 K are described. The percentage of carbon converted and its density are calculated and tabularly presented. The results reveal that dense carbon formation is maximized and soot eliminated by this procedure. It is observed that conversion efficiency depends on the composition of the inlet gas and conversion increases with increasing temperature. Based on the experimental data a three-man carbon reactor subsystem (CRS) is developed; the functions of the Sabatier Methanation Reactor, two carbon formation reactors and fluid handling components of the CRS are analyzed. The CRS forms 16 kg of carbon at a rate of 0.8 kg/day for 20 days in a two percent volume density quartz wool packing at temperature of 1500-1600 K. I.F.

A86-23530
COMPARISON OF CO2 REDUCTION PROCESS - BOSCH AND SABATIER
L. SPINA and M. C. LEE (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. refs
(SAE PAPER 851343)

An essential technology for making long-term, manned space missions a reality is related to regenerative life support processes for the revitalization of the spacecraft atmosphere. A major step in such processes is concerned with the reduction of metabolically produced CO2 for subsequent recovery of oxygen. The Bosch and Sabatier processes represent two leading candidates for CO2 reduction. Both processes are being investigated by NASA with respect to their applicability to the Space Station ECLSS (Environmental Control/Life Support Systems) requirements. In the Bosch process CO2 reacts catalytically with H2 to produce water and solid carbon, while the Sabatier process involves the catalytic reaction of CO2 and H2 to produce water and methane. The Bosch CO2 reduction subsystem is discussed along with the Sabatier CO2 reduction subsystem. G.R.

A86-23531
MEMBRANE-BASED WATER- AND ENERGY-RECOVERY SYSTEMS FOR THE MANNED SPACE STATION
R. RAY (Bend Research, Inc., OR) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 16 p. refs
(SAE PAPER 851345)

This paper describes four membrane-based subsystems to use in the waste-water treatment system of the manned space station being planned by NASA. These membrane-based subsystems involve the recycle of the various wastewater streams and result in increased energy efficiency. Furthermore, in these four subsystems, the membrane acts as a barrier between the wastewater source and the wastewater treatment and consumption systems, thus increasing the reliability of these systems. Finally, the membranes are highly impermeable to the contaminants in the wastewaters and thus help to reduce the load on such expendables as post-treatment adsorption beds. Author

A86-23532* Life Systems, Inc., Cleveland, Ohio.
PHASE CHANGE WATER PROCESSING FOR SPACE STATION
E. M. ZDANKIEWICZ (Life Systems, Inc., Cleveland, OH) and D. F. PRICE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p.
(SAE PAPER 851346)

The use of a vapor compression distillation subsystem (VCDS) for water recovery on the Space Station is analyzed. The self-contained automated system can process waste water at a rate of 32.6 kg/day and requires only 115 W of electric power. The improvements in the mechanical components of VCDS are studied. The operation of VCDS in the normal mode is examined. The VCDS preprototype is evaluated based on water quality, water production rate, and specific energy. The relation between water production rate and fluids pump speed is investigated; it is concluded that a variable speed fluids pump will optimize water production. Components development and testing currently being conducted are described. The properties and operation of the proposed phase change water processing system for the Space Station, based on vapor compression distillation, are examined. I.F.

A86-23533* Astro Resources International Corp., League City, Tex.
WATER QUALITY MONITOR FOR RECOVERED SPACECRAFT WATER
E. M. EJZAK (Astro Resources International Corp., League City, TX) and D. F. PRICE (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 6 p.
(Contract NAS9-16846)
(SAE PAPER 85-1347)

A total organic carbon (TOC) analysis system based on ultraviolet absorption is described. The equation for measuring the intensity of the absorbed radiation of the organic substances, which is based on the Lambert-Beer law, is given; the intensity of the absorption is proportional to the concentration of the solution. The operation of the UV-Absorption analyzer, which utilizes a split beam, two wvaelength method, is studied. The influences of the cell path length and specific compounds in the solution flowing through the cell on absorbances is discussed. The performance and response of the analyzer is evaluated; good correlation is observed between the absorption value and TOC. The advantage of the UV-Absorption as compared with the UV-Oxidation are examined. I.F.

A86-23534
THERMOELECTRIC INTEGRATION MEMBRANE EVAPORATION SUBSYSTEM WATER RECOVERY - TECHNOLOGY UPDATE
G. F. DEHNER (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and R. P. REYSA (Boeing Aerospace Co., Seattle, WA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 8 p. refs
(SAE PAPER 851348)

A three-person preprototype Thermoelectric Integrated Membrane Evaporation Subsystem (TIMES I) has undergone additional wastewater processing testing in order to evaluate a redesigned evaporator assembly. The new evaporator design incorporates a number of concepts that have been selected for use in the next generation advanced preprototype subsystem design. A discussion of the operating performance of the TIMES I preprototype with the new evaporator installed is presented in this paper, as well as a more detailed description of the design changes currently being implemented in the improved water recovery subsystem (TIMES II). Special attention is given in this discussion to the improved maintenance aspects of the advanced preprototype evaporator/condenser assembly. In addition, specific advanced preprototype design information is provided in order to illustrate the end product of previous design studies. Author

A86-23535* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION NITROGEN SUPPLY SYSTEM BASED ON STORED CHEMICALS
F. T. POWELL (NASA, Ames Research Center, Cleveland, OH) and M. SCHWARTZ AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 11 p. refs
(SAE PAPER 851349)

The Space Station atmosphere is to have an 'earth-like' composition, and nitrogen is to be routinely supplied to replace losses. The required nitrogen is to be provided by an innovative method, involving a catalytic dissociation of liquid N2H4 and separation of the product nitrogen and hydrogen mixture. The considered technique of nitrogen storage and resupply has several advantages in comparison to methods using either cryogenic liquid or high pressure nitrogen. One advantage is related to savings with respect to launch weight, while a second advantage is provided by the obtained hydrogen which is available for other uses within the Space Station. G.R.

A86-23555* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WET OXIDATION OF A SPACECRAFT MODEL WASTE
C. C. JOHNSON and T. WYDEVEN (NASA, Ames Research Center, Moffett Field, CA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851372)

Wet oxidation was used to oxidize a spacecraft model waste under different oxidation conditions. The variables studied were pressure, temperature, duration of oxidation, and the use of one homogeneous and three heterogeneous catalysts. Emphasis is placed on the final oxidation state of carbon and nitrogen since these are the two major components of the spacecraft model waste and two important plant nutrients. Author

A86-23557* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PERFORMANCE AND ENDURANCE TESTING OF A PROTOTYPE CARBON DIOXIDE AND HUMIDITY CONTROL SYSTEM FOR SPACE SHUTTLE EXTENDED MISSION CAPABILITY
C. H. LIN and R. J. CUSICK (NASA, Johnson Space Center, Houston, TX) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p. refs
(SAE PAPER 851374)

An advanced flight prototype regenerable CO2 and humidity control system was delivered to NASA-JSC in February 1980. It is pointed out that this system offers substantial weight savings compared with the Shuttle Orbiter expendable lithium hydroxide CO2 removal system for extended duration missions. The present paper provides a brief description of the 4- to 10-man regenerable CO2 and humidity control system. The potential advantages which can be realized for an extended duration Shuttle mission are considered along with the results of extensive testing conducted at JSC. The performance evaluation and endurance tests show that the system is capable of long-term operation (up to 60 days) without maintenance. G.R.

A86-23558* Life Systems, Inc., Cleveland, Ohio.
SPACE STATION ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM ENGINEERING
C. W. MILLER and D. B. HEPPNER (Life Systems, Inc., Cleveland, OH) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. Research supported by Life Systems, Inc. and NASA. refs
(SAE PAPER 851375)

The present paper is concerned with a systems engineering study which has provided an understanding of the overall Space Station ECLSS (Environmental Control and Life-Support System). ECLSS/functional partitioning is considered along with function criticality, technology alternatives, a technology description, single thread systems, Space Station architectures, ECLSS distribution, mechanical schematics per space station, and Space Station ECLSS characteristics. Attention is given to trade studies and system synergism. The Space Station functional description had been defined by NASA. The ECLSS will utilize technologies which embody regenerative concepts to minimize the use of expendables. G.R.

A86-23559* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS TECHNOLOGY OPTIONS FOR SPACE STATION APPLICATION
J. B. HALL, JR., M. J. FEREBEE, JR. (NASA, Langley Research Center, Hampton, VA), and K. H. SAGE (Kentron International, Inc., Hampton, VA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 19 p. refs
(SAE PAPER 851376)

Continuous assessments regarding the suitability of candidate technologies for manned Space Stations will be needed over the next several years to obtain a basis for recommending the optimum system for an Initial Operating Capability (IOC) Space Station which is to be launched in the early 1990's. This paper has the objective to present analysis programs, the candidate recommendations, and the recommended approach for integration these candidates into the NASA Space Station reference configuration. Attention is given to ECLSS (Environmental Control and Life Support System) technology assesament program, an analysis approach for candidate technology recommendations, mission model variables, a candidate integration program, metabolic oxygen recovery, urine/flush water and all waste water recovery, wash water and condensate water recovery, and an integration analysis. G.R.

A86-23560* Hamilton Standard, Windsor Locks, Conn.
UTILITY OF AN EMULATION AND SIMULATION COMPUTER MODEL FOR AIR REVITALIZATION SYSTEM HARDWARE DESIGN, DEVELOPMENT, AND TEST
J. L. YANOSY (United Technologies Corp., Hamilton Standard Div., Windsor Locks, CT) and L. F. ROWELL (NASA, Langley Research Center, Hampton, VA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p. refs
(SAE PAPER 851377)

Efforts to make increasingly use of suitable computer programs in the design of hardware have the potential to reduce expenditures. In this context, NASA has evaluated the benefits provided by software tools through an application to the Environmental Control and Life Support (ECLS) system. The present paper is concerned with the benefits obtained by an employment of simulation tools in the case of the Air Revitalization System (ARS) of a Space Station life support system. Attention is given to the ARS functions and components, a computer program overview, a SAND (solid amine water desorbed) bed model description, a model validation, and details regarding the simulation benefits. G.R.

A86-23567* Massachusetts Inst. of Tech., Cambridge.
POTENTIAL FOR UTILIZATION OF ALGAL BIOMASS FOR COMPONENTS OF THE DIET IN CELSS
A. R. KAMAREI, Z. NAKHOST, and M. KAREL (MIT, Cambridge, MA) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 12 p. NASA-supported research. refs
(SAE PAPER 851388)

Techniques which eliminate or reduce the undesirable cell components of algae and enhance the potential nutritional and organoleptic acceptability of algae products are studied. The cell walls, nucleic acids, and pigments and lipids of the green algae Scenedesmus obliquus need to be removed. The procedures for determining the composition of proteins, pigments and lipids, and moisture and ash are described. Chemical, enzymatic, and physical methods of removing the cell wall to make the algae digestable are analyzed; a homogenization technique is utilized. The problems encountered if algae nucleic acids are ingested directly are discussed; the reduction of DNA and RNA by applying extracellular DNase and RNase to the nucleic acids is examined. The color and flavor of the algae are enhanced with the extraction of pigments and lipids from the algae protein concentration. I.F.

A86-23569
BLSS, A EUROPEAN APPROACH TO CELSS
A. I. SKOOG (Dornier System GmbH, Friedrichshafen, West Germany) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 13 p.
(SAE PAPER 851391)

The development of a biological life support system (BLSS) for space is examined. The proposed design for the BLSS is a closed loop system which supplies O2, food, and water, and maintains a balanced, stable spacecraft ecology. The terrestrial and space experiments, which focus on cultivating plants that will provide the crew with an adequate food supply, designing and testing of a terrestrial reference system, microgravity and cosmic radiation effects, and the use of PAR-radiation and high energy particle radiation protection, are studied. The functions of the Solar Plant Power Facility are investigated. The closed loop ecological life support system (ELSS) created by the ELSS technology study is analyzed. I.F.

A86-23570
CELSS EXPERIMENT MODEL AND DESIGN CONCEPT OF GAS RECYCLE SYSTEM
K. NITTA, M. OGUCHI (National Aerospace Laboratory, Tokyo, Japan), and S. KANDA (Kawasaki Heavy Industries, Ltd., Submarine Designing Dept., Kobe, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 14 p. refs
(SAE PAPER 851393)

In order to prolong the duration of manned missions around the earth and to expand the human existing region from earth to other planets such as a Lunar Base or a manned Mars flight mission, the CELSS becomes an essential factor of the future technology to be developed through utilization of the Space Station. The preliminary system engineering and integration efforts regarding CELSS have been carried out by the Japanese CELSS concept study group for clarifying the feasibility of hardware development for Space Station Experiments and for getting the time phased mission sets after Fy 1992. The results of these studies are briefly summarized, and the design and utilization methods of a gas recycle system for CELSS experiments are discussed. Author

A86-23571
UTILIZATION OF MEMBRANES FOR H2O RECYCLE SYSTEM
H. OHYA (Yokohama National University, Japan) and M. OGUCHI (National Aerospace Laboratory, Chofu, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 9 p.
(SAE PAPER 851394)

Conceptual studies of closed ecological life support systems (CELSS) carried out at NAL in Japan for a water recycle system using membranes are reviewed. The system will treat water from shower room, urine, impure condensation from gas recycle system, etc. The H2O recycle system is composed of prefilter, ultrafiltration membrane, reverse osmosis membrane, and distillator. Some results are shown for a bullet train of toilet-flushing water recycle equipment with an ultrafiltration membrane module. The constant value of the permeation rate with a 4.7 sq m of module is about 70 l/h after 500 h of operation. Thermovaporization with porous polytetrafluorocarbon membrane is also proposed to replace the distillator. Author

A86-23575
WET-OXIDATION WASTE MANAGEMENT SYSTEM FOR CELSS
Y. TAKAHASHI (Niigata University, Japan) and H. OHYA (Yokohama National University, Japan) AIAA, SAE, ASME, AIChE, and ASMA, Intersociety Conference on Environmental Systems, 15th, San Francisco, CA, July 15-17, 1985. 10 p.
(SAE PAPER 851398)

A wet oxidation system which is to treat organic wastes and redistribute inorganic compounds and elements is examined. The effect of temperature and reaction time on the solubility of carbon, nitrogen, and phosphorus in the oxidized water is investigated. The application of noble gas catalysts to the carbon and nitrogen reactions, and the need to develop catalysts which will complete oxidation and nitrification are analyzed. The behavior of metals in wet oxidation is studied. I.F.

A86-23701
HUMAN FACTORS SOCIETY, ANNUAL MEETING, 28TH, SAN ANTONIO, TX, OCTOBER 22-26, 1984, PROCEEDINGS. VOLUMES 1 & 2
E. A. ALLUISI, ED. (USAF, Human Resources Laboratory, Brooks AFB, TX), M. J. ALLUISI, ED., and S. DE GROOT, ED. Santa Monica, CA, Human Factors Society, 1984. Vol. 1, 566 p.; vol. 2, 505 p. For individual items see A86-23702 to A86-23750.

Developments regarding methods and techniques are considered along with human factors in falls of the elderly, prototyping and design of computer systems, consumer product design, human factors in system safety and robotics, visual performance and display design, mental models, the selection and evaluation of computer systems, programs and techniques in human factors education, industrial ergonomics, and industrial safety. Topics related to human factors and nuclear power are discussed, taking into account a systems approach to improved operations, a maintenance personnel performance simulation model, and nuclear power plant control room operators' performance research. Attention is also given to visual display design, computer displays, new alternatives in managing human factors and human resources functions, army aviation selection and training, visual detection and tracking, applications of fuzzy sets and systems methodologies in human factors, human factors and automation technology, computer based training, and human factors in computerized I/O communications products. G.R.

A86-23702
THE EFFECT OF ASYMMETRIC TRANSFER ON DUAL-TASK ASSESSMENT OF VOICE TECHNOLOGY
D. L. DAMOS and E. A. LYALL (Arizona State University, Tempe) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 21-25.
(Contract N00014-82-C-0179)

This experiment examines the effect of asymmetric transfer on multiple-task performance in a voice technology study. Male subjects performed a mental arithmetic and a visual memory task alone and together. Stimuli for the mental arithmetic task were presented either visually or auditorily; responses were made either vocally or manually. Stimuli for the visual memory task were always presented visually; responses were always made manually. Preliminary analyses revealed a number of statistically significant effects favoring auditory input and speech response. However, these analyses also revealed asymmetric transfer between response conditions. When the data affected by the asymmetric transfer were eliminated from subsequent analyses, no significant advantages for speech over manual response were found. The significance of these results for voice technology studies is discussed. Author

A86-23703
AN EMPIRICAL DEMONSTRATION OF MULTIPLE RESOURCES
W. L. DERRICK and T. M. MCCLOY (U.S. Air Force Academy, Colorado Springs, CO) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 26-30. USAF-supported research.

Results obtained by Gopher et al. (1982) suggest that evidence for multiple processing resources can be demonstrated only if both task difficulty and task priorities are manipulated in dual task studies. The present paper reports an experiment which was to replicate the study conductd by Gopher et al. Ten right-handed male subjects participated in the experiment. The subjects performed a dual-axis compensatory tracking task of first order

dynamics using a joystick with their right hand. A noise generator randomly perturbed the signal to be tracked. The results obtained in the experiment essentially replicate the findings reported by Gopher et al. Inspection of the Performance Operating Characteristics (POC) functions from both studies, however, suggests that more than two resources are involved. G.R.

A86-23704
A TECHNOLOGY FORECASTING AND ASSESSMENT METHOD FOR EVALUATING SYSTEM UTILITY AND OPERATOR WORKLOAD

R. G. EGGLESTON and P. V. KULWICKI (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 31-35.

In the context of system design, technology assessment often proceeds in a bottom-up fashion, beginning with an evaluation of individual candidate system technologies. Issues of technology integration and human factors considerations are not addressed until later in system development. This paper proposes the use of a top-down approach to technology assessment. The top-down approach has the advantage of evaluating technologies along dimensions of system utility, as well as technical performance, and treating human factors early in conceptual design. A technology forecasting and assessment methodology is described wherein technologies can be evaluated quantitatively in terms of technical performance, system utility, and operator workload. Author

A86-23707
A COMPUTER-BASED SYSTEM FOR WORKSTATION DESIGN AND ANALYSIS

L. C. BUTTERBAUGH and J. K. MCBRIDE (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 63-66. refs

The design of aircraft crew stations, powerplant control room consoles, and other man-machine systems is a complex task which includes also the consideration of a number of human factors issues. As traditional design approaches require much time and considerable expenditures of manpower, the employment of computer-based methods has been considered to achieve a more efficient and effective crew station design process. Thus, numerous compter aided design and evaluation techniques (CADETs) have been developed which can be used for the design and the evaluation of man-machine systems from a human factors standpoint. In an effort to upgrade the tools and methods available to the designers and human factors engineers of the Crew Systems Development Branch of the U.S. Air Force, the relative merits of a wide variety of CADETs were discussed at a workshop. The present paper is concerned with these discussions and the resulting conclusions. G.R.

A86-23711
EYE-CONTROLLED SWITCHING FOR CREW STATION DESIGN

G. L. CALHOUN, K. R. BOFF (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and C. J. ARBAK (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 258-262. refs
(Contract F33615-82-C-0511)

Integration of eye and head position monitoring devices may enable practical control of systems using the operator's eye line-of-sight (LOS) under conditions of free head and eye movement. This paper describes the components of an eye-control system developed to examine the use of eye LOS as an alternate control interface for crew station design. The implications of the performance of this system to the implementation of eye-controlled switching are discussed. Author

A86-23712
THE EFFECTS OF REDUNDANCY, TARGET DENSITY AND PRACTICE ON A COMPLEX VISUAL SEARCH TASK

M. J. PATTERSON, W. J. ENGELMAN, L. J. NAJJAR, and G. M. CORSO (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 299-302. refs

In connection with increased prevalence of visual display units, the search and acquisition of information in various visual displays has become increasingly important. Often color is combined with another dimension to produce a redundant code which may improve performance above that obtained in the case of the single original dimension. There is, however, conflicting evidence on the efficacy of the use of a redundant code in a visual search task. The present paper is concerned with an experiment which was designed to investigate redundant coding in an ATC simulation. The primary objective of this study was to increase the transmission of the displayed information. The study involved the examination of redundant code (color with alphanumerics) versus an achromatic, uni-dimensional code in a visual search task. It is concluded that the inclusion of color will not necessarily improve performance within visual tasks of this type. G.R.

A86-23713
COLOR CODING OF SYNTHETIC APERTURE RADAR IMAGERY

F. WARD, D. WILSON (Wright State University, Dayton, OH), D. WALLQUIST, and G. KUPERMAN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 303-307. refs

The purpose of the study was to investigate four types of coding strategies using the same Synthetic Aperture Radar (SAR) imagery. Unclassified SAR imagery were digitized to include scenes from urban areas, seaports, oil refineries, industrial sites, an airfield, and power transmission lines. Two color and two black and white (BW) coding schemes were applied to the imagery. Five experienced radar interpreters were briefed and viewed 35 mm slides of the imagery. They judged image usefulness by reference to an interpretability scale. Analysis of the ratings showed that the BW codes received significantly higher interpretability ratings than the color codes. Author

A86-23723
COGNITIVE ATTRIBUTES TO GUIDE DISPLAY DESIGN IN AUTOMATED COMMAND-AND-CONTROL SYSTEMS

E. D. MURPHY (Computer Sciences Corp., Silver Spring, MD) and C. M. MITCHELL (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 418-422. refs

The capacity of the short-term and working memory is examined. The need for display designs which activate the appropriate schema and initiate effective cognitive processing is discussed. The relationship between cognitive attributes, such as hierarchical organization of knowledge, failure-driven memory, multilevel processing, and strategic problem solving and display designs is analyzed. The effect of automation on these attributes is studied. I.F.

A86-23724
COCKPIT AUTOMATION TECHNOLOGY

A. J. ARETZ (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1984, p. 487-491.

This paper presents a prototype methodology conceived by the United States Air Force to establish a baseline approach in the development of a new human factors crew station design methodology for emerging weapon systems. The goal of the project is to develop a structured human factors design methodology that

can be used by designers to assess emerging technologies and relate them to system requirements and human performance characteristics so that the features of the resulting designs satisfy specific operational mission objectives. Author

A86-23734
MESSAGE-BASED SCREEN INTERFACES - THE EFFECTS OF PRESENTATION RATES AND TASK COMPLEXITY ON OPERATOR PERFORMANCE
R. HALSTEAD-NUSSLOCH and R. E. GRANDA (IBM Corp., Human Factors Development Dept., Poughkeepsie, NY) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 740-744.

The present experiments investigated the effects of varying message-presentation rate and task complexity on human performance. Variables examined in the experiments included message rate, message presentation format, probability of a target message, and number of response alternatives for target messages. Response accuracy was used as a measure of operator performance. Significant main effects were obtained on all independent variables, except format of message flow. Increasing the message rate, target probability, and number of target categories resulted in poorer accuracy. In general, decreases in accuracy were accentuated when two or more of the manipulated factors were increased. This negative synergism must be taken into account in designing a user-system interface for control systems based on textual-message communications. Author

A86-23735
RESEARCH ISSUES IN TELEOPERATOR SYSTEMS
R. L. PEPPER and J. D. HIGHTOWER (U.S. Naval Ocean Systems Center, Kailua, HI) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 803-807. refs

Existing teleoperators have been very useful in providing support to the offshore oil industry and the salvage community. However, there is a fundamental limitation. These teleoperators are designed to perform only a very restricted range of specific tasks, and unanticipated events can occur which severely tax these specialized teleoperators' capabilities and render them ineffective. It is, therefore, felt that anthropomorphically-designed teleoperators offer the best means of transmitting man's remarkably adaptive problem solving and manipulative skills into the oceans' depths. Several approaches toward the goal of a mature teleoperator technology are identified. Attention is given to teleoperator viewing systems, the possible advantages of using motion parallax cues as an aid to depth perception, and efforts toward the creation of a general model of anthropomorphic teleoperator performance. G.R.

A86-23736* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
HUMAN OPERATOR CONTROL OF A BILATERAL TELEOPERATOR IN PART-SIMULATION OF ZERO GRAVITY
K. CORKER (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) and J. REGER (California State University, Northridge) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 810-814. NASA-supported research. refs

Remote manipulators (teleoperators) are defined as mechanical devices which extend human manipulative ability to operational environments which are either hostile to or remote from the human operator. Teleoperation involves the explicit and active inclusion of the human operator (HO) in the system control loop. An investigation of human/teleoperator control interactions in the orbital operational environment has been conducted, taking into account the employment of a model describing human neuromotor control as a linear damped harmonic oscillator. The application of this model for the specification of the end point position in teleoperator control is explored, and two experiments are conducted. The results indicate the potential utility of relatively simple models of neuromotor control processes in investigating the interaction of the human operator and controller in teleoperation. G.R.

A86-23737
A DIGITAL IMAGE PROCESSING FACILITY FOR HUMAN FACTORS RESEARCH
G. G. KUPERMAN, D. L. WALLQUIST (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and L. KATZ (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 815-819. refs

In human factors research, it is often necessary to obtain highly controlled, visual stimulus materials for use in the operator performance studies. In this context, it has been found that digital image processing system capabilities provide the human factor practitioner with powerful techniques for application against a wide range of problems. The Visual Image Processing, Enhancement, and Reconstruction (VIPER) facility was, therefore, established to identify, develop, and apply digital image processing techniques against a variety of Air Force research objectives. The present paper provides an overview of digital image processing, and a description of the VIPER facility. Attention is also given to current and planned examples involving the application of digital image processing to human factors engineering problems. G.R.

A86-23738
CONCEPT FLYING - A METHOD FOR DERIVING UNIQUE SYSTEM REQUIREMENTS
J. C. SIMONS and S. B. HOTTMAN (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 825-828. refs

Simons (1974) discussed an approach to achieving concept breakthroughs by inserting intuitive researchers in loosely structured, scaled-down situations. The approach involves the observation of the pilot when he is interacting in a loosely constrained operational environment. The considered approach, called 'concept flying', represents a technique for the development of new systems designs. Today the main shortfall of concept flying techniques is that they are seldom used. The present paper provides successful concept-flight programs, and new proposals for using concept flying in a study of concepts which are beyond the capabilities of current aircraft. G.R.

A86-23742* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACE STATION CREW SAFETY - HUMAN FACTORS MODEL
M. M. COHEN and M. K. JUNGE (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 908-912. Previously announced in STAR as N85-29540.

A model of the various human factors issues and interactions that might affect crew safety is developed. The first step addressed systematically the central question: How is this Space Station different from all other spacecraft? A wide range of possible issue was identified and researched. Five major topics of human factors issues that interacted with crew safety resulted: Protocols, Critical Habitability, Work Related Issues, Crew Incapacitation and Personal Choice. Second, an interaction model was developed that would show some degree of cause and effect between objective environmental or operational conditions and the creation of potential safety hazards. The intermediary steps between these two extremes of causality were the effects on human performance and the results of degraded performance. The model contains three milestones: stressor, human performance (degraded) and safety hazard threshold. Between these milestones are two countermeasure intervention points. The first opportunity for intervention is the countermeasure against stress. If this countermeasure fails, performance degrades. The second

opportunity for intervention is the countermeasure against error. If this second countermeasure fails, the threshold of a potential safety hazard may be crossed. R.J.F.

A86-23744
THE USE OF ACCIDENT STATISTICS TO INFLUENCE SIMULATOR DESIGN
R. P. BATEMAN and S. B. HOTTMAN (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 917-920. refs

The causes of aircraft accidents during low level operations may be categorized into five areas. These are vision, attention, knowledge, judgment, and discipline. The thesis presented in this paper is that for simulators to be effective in reducing the aircraft accident rate, they must provide training in at least one (and preferably all) of these areas. This training must include experience in preventing the occurrence of hazardous conditions, in recognizing the hazardous conditions as they develop, and in taking the appropriate corrective action to prevent an accident. For the student, all of this requires appropriate inputs, realistic scenarios, opportunity for errors, and immediate feedback on the consequences of those errors. For the instructor, there is a need to provide information on the causes of errors. Author

A86-23746
THE EFFECT OF INTERVENING TASK PERFORMANCE ON SUBJECTIVE WORKLOAD RATINGS
F. T. EGGEMEIER (Wright State University; Systems Research Laboratories, Inc., Dayton, OH), B. E. MELVILLE (Wright State University, Dayton, OH), and M. S. CRABTREE (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 954-958. refs

Thirty subjects performed a short-term memory task and used the Subjective Workload Assessment Technique (SWAT) to provide workload ratings under one of five conditions. Ratings were provided either immediately following task performance, after a delay period during which no additional tasks were performed, or after a delay period during which an additional set of memory tasks at one of three levels or difficulty was performed. Neither the delay interval nor the requirement to perform a set of intervening tasks significantly affected mean SWAT ratings relative to the immediate rating control condition. Patterns in the data suggested that performance of a set of difficult intervening tasks had the greatest tendency to affect memory task ratings, and indicate that the potential influence of intervening task performance should not be completely discounted in workload rating scale applications. Author

A86-23747
THE USE OF REFLECTIVE SWAT FOR WORKLOAD ASSESSMENT
C. J. ARBAK, R. L. SHEW, and J. C. SIMONS (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 959-962. refs
(Contract F33615-82-C-0511)

Reid et al. (1981) have proposed the Subjective Workload Assessment Technique (SWAT) as a generally applicable measure of operator workload. The SWAT technique applies the mathematics of conjoint measurement to assign a single measure of workload based on task ratings in three categories, including time, effort, and stress. It is pointed out that SWAT has typically been used to assess workload at a particular point in an ongoing or just completed task. In the present paper, the term immediate or in-flight SWAT is employed in connection with such an application. In many cases, however, it would be useful to be able to evalate workload through the operator's reflections on mission performance rather than through an immediate rating of workload. Advantages of such a 'reflective SWAT' are related to the possibility of an estimate of workload which reflects a more general set of conditions. In this paper, two examples of the use of reflective SWAT in combination with an interview are discussed. G.R.

A86-23748
DEVELOPMENT OF AN AUTOMATED ANTHROPOMETRIC DATA MEASUREMENT SYSTEM (AADMS)
W. F. MORONEY, R. E. HUGHES (U.S. Navy, Naval Air Test Center, Patuxent River, MD), and R. J. SPICUZZA (Systems Research Laboratories, Inc., Patuxent River, MD) IN: Human Factors Society, Annual Meeting, 28th, San Antonio, TX, October 22-26, 1984, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1984, p. 1003-1005.

Due to the limited space available in modern cockpits and crewstations, certain critical anthropometric features of an aviator must be measured properly. Unreasonable and erroneous anthropometric values are sometimes recorded because of measuring and operator errors. The purpose of the Automated Anthropometric Data Measurement System (AADMS - pronounced ADMAS) is to reliably and accurately measure anthropometric features in a timely and efficient manner and to eliminate the source of many of these errors. AADMS utilizes a microcomputer interfaced to a variety of position sensors and transducers to gather and internally verify data on 11 anthropometric parameters. Author

A86-24121
PHYSIOLOGICAL INSIGHTS GAINED THROUGH ZERO-G MEDICAL RESEARCH
S. ZEIDLER Commercial Space (ISSN 8756-4831), vol. 1, Fall 1985, p. 58, 60.

The advantages medical experiments and manufacturing processes provide to the study of human physiology are investigated. The applications of electrokinetic separation in space to the isolation and examination of cell subgroups and the space electrophoresis for purification of hormones, enzymes, and proteins are discussed. The manipulation of fibrillogenensis of collagen for use as a replacement tissue or in surface tension casting is being studied. Pharmaceutical participation in space research includes the production and analysis of organic crystals which provide information on the molecular structure that is utilized in drug design and protein engineering. Electrophoresis experiments which are being conducted in space are examined. A study to evaluate if purification techniques for human growth hormones are more effective in space is described. I.F.

A86-25199#
SODIUM AND POTASSIUM RECYCLE IN CLOSED ECOSYSTEM-SPACE AGRICULTURE
M. YAMASHITA, H. OHYA, K. NITTA, and M. YATAZAWA Japan Society for Aeronautical and Space Sciences, Journal (ISSN 0021-4663), vol. 33, no. 376, 1985, p. 288-296. In Japanese, with abstract in English. refs

Sodium and potassium separation is studied for a closed ecological life support system (CELSS) and space agriculture program. The purpose of the system is to recycle minerals between man and higher plants in a closed system. For physiological reasons, man requires a greater amount of sodium than that contained in plants. For regenerative production of foods by the use of higher plants, it is necessary to remove excess sodium from human wastes. Several kinds of physicochemical and biological methods are discussed to examine their feasibility in this application. Author

A86-25229#
ON THE PILOT'S BEHAVIOR OF DETECTING A SYSTEM PARAMETER CHANGE
N. MORIZUMI and H. KIMURA Japan Society for Aeronautical and Space Sciences, Journal (ISSN 0021-4663), vol. 33, no. 380, 1985, p. 532-539. In Japanese, with abstract in English. refs

This paper deals with the detection characteristics of a human pilot, who is engaged in a compensatory control, to a sudden change in the controlled element's characteristics. Taking the case where the change manifests itself as a variance change of the monitored signal, it is shown that the detection time, defined to be the time elapsed until the pilot detects the change, is related to the monitored signal and its derivative. Then, the detection behavior is modeled by an optimal controller, an optimal estimator, and a variance-ratio test mechanism that is performed for the monitored signal and its derivative. Results of a digital simulation show that the pilot's detection behavior can be well represented by the model proposed here. Author

A86-25651
NOISE LEVELS IN COCKPITS OF AIRCRAFT DURING NORMAL CRUISE AND CONSIDERATIONS OF AUDITORY RISK
D. C. GASAWAY (Cabot Corp., E-A-R Div., Indianapolis, IN) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 103-112. refs

Noise data, including A-levels and C-minus-A values, are summarized for exposures associated with normal cruise flight in 13 groups of 593 aircraft; means and standard deviations are reported; degrees of auditory risk using OSHA-1983 criterion are presented; and at-the-ear protected and unprotected exposures are revealed. Mean A-levels were 95.0 for 528 fixed-wing; 100.9 for 65 rotary-wing; and 95.7 for all 593 aircraft. Of 13 subgroups, the lowest mean A-level (85.5) was exhibited in the cockpits of tail-mounted turbojet/fan-powered aircraft, and the highest (105.0) was found in both reciprocating and turbine-powered twin-rotor helicopters. All means A-levels exceeded the OSHA damage-risk criterion for 8 h/d exposures. At-the-ear exposures while wearing hearing protection are presented. Results clearly illustrate the potential for auditory damage of unprotected aircrews. Hearing protection must be considered to effectively control routinely encountered exposures. The material and illustrations resulting from this study will help health and safety monitors during indoctrination and counseling of aircrews concerning the need to protect their hearing against noise exposures during normal and routine flight operations. Author

A86-25652
EFFECT OF SEAT CUSHIONS OF HUMAN RESPONE TO +GZ IMPACT
B. F. HEARON and J. W. BRINKLEY (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 113-121. refs
(Contract F33615-83-C-0500)

Several ejection seat cushions are evaluated based on human response to vertical impact acceleration. The cushions consist of: (1) one layer of 5.1 cm thick low-density conventional polyurethane foam and a second layer of 1.3 cm thick high-density plastic foam (F-111 cushion); (2) a layer of 1 cm thick sheet foam polyethylene, 1.3 cm Temper foam, and 0.6 cm thick space fabric (ACES II cushions); and (3) 5.1 cm thick rate-dependent slow-recovery polyurethane foam. Vertical impact tests were performed on 25 subjects of 26.1 + or - 3.4 years, weighing 79.1 + or - 9.0 kg, and 178 + or - 7.1 cm tall; the test conditions and equipment are described. The carriage acceleration and velocity, seat loads, and head and chest acceleration are measured and compared. The data reveal that the F-111 and ACES II cushions have higher seat loads and head and chest accelerations than the rate-dependent polyurethane foam cushions; it is concluded that the rate-dependent cushions provided greater impact protection than current operational cushions. I.F.

A86-25657
EFFECT OF WEARING CHEMICAL PROTECTIVE CLOTHING IN THE HEAT ON SIGNAL DETECTION OVER THE VISUAL FIELD
J. L. KOBRICK and L. A. SLEEPER (U.S. Army, Army Research Institute of Environmental Medicine, Natick, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, Feb. 1986, p. 144-148. refs

Sensitivity for detecting visual signals distributed at various locations throughout the visual field was studied in 16 male subjects who were all exposed to two degrees of ambient heat (91 F/61 percent RH; 55 F/35 percent RH) while wearing the Army chemical protective clothing system; also to 70 F/35 percent RH while wearing Army battle-dress uniform (fatigues). Response time for signal detection increased systematically and significantly with peripheralization of stimulus locations. It was most impaired in the superior and inferior visual field areas and least affected along the horizontal axis area. The data support previous results obtained using this task. Both the Military Oriented Protective Posture (MOPP) and the heat + MOPP exposure conditions produced highly significant systematic increases in response time to all signals; the worst performance occurred under the heat + MOPP combination. Implications for visual performance while wearing chemical protective gear are discussed. Author

A86-26001
AEROSPACE BEHAVIORAL ENGINEERING TECHNOLOGY CONFERENCE, 3RD, LONG BEACH, CA, OCTOBER 15-18, 1984, PROCEEDINGS
Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc., 1984, 322 p. For individual items see A86-26002 to A86-26033.
(SAE P-151)

The topics addressed include the use of flight deck technology to complement the flight crew's role in automation; pilot-machine cooperation in presence of mission uncertainty in connection with military cockpit design; current and advanced displays; pilot workload and performance; and civil aviation human performance issues. Additional subjects include the Air Force test pilot's perspective of the man/machine interface; man/machine interface research and development needs for civil aviation; fitness for duty; safety assurance in the air carrier operating environment; advanced technology for rotorcraft; and a case for realistic training in abnormal and emergency situations. In addition, papers are presented on questions of flight deck automation decisions, effect of vibration on the readability of color CRT displays, the training and certification of the general aviation pilot, and effects of digital altimetry on pilot workload. I.S.

A86-26002
FLIGHT DECK AUTOMATION DECISIONS
E. F. WEENER (Boeing Commercial Airplane Co., Seattle, WA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 3-8. refs
(SAE PAPER 841471)

Effective man-machine interface design for an airplane flight deck depends strongly on providing appropriate levels of control capability for use by the flight crew. The range of control options available to the airplane system designer extends from manual through partially automatic to full automatic. Selection of appropriate types and levels of automation for each new airplane is a complex task. It involves understanding the capabilities and limitations of the human operator, airplane operational and functional considerations, as well as concerns for cost and available technology. Recent airplanes have demonstrated the practicality of providing different levels of automation which can be applied by the flight crew under different circumstances. This trend expands the options available to the flight crew in coping with the changing operational environment. It also allows the flight crew to participate directly in the choice of when and how to apply automation. This paper describes the various automation factors which are considered in the process of developing a design. Author

A86-26003
FLIGHT DECK DESIGN METHODOLOGY USING COMPUTERIZED ANTHROPOMETRIC MODELS
G. STONE and H. MCCAULEY (Douglas Aircraft Co., Long Beach, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 9-16. refs
(SAE PAPER 841472)

A new 'inside out' flight deck design methodology has been developed, in which the flight crew member is the logical starting point. Several computer models that simulate varying pilot sizes, proportions, reach, and vision capabilities are created and utilized to generate the required 'envelopes' of vision, reach, and motion for the entire range of the pilot population. These envelopes are then employed to define the internal geometric relationships of the flight deck and its components. The methodology is described, including discussions of the aspects of defining the user population, generation of crew sample, creating a three-dimensional operator model, determining functional envelopes, and component integration. Design diagrams are included. I.S.

A86-26004
AI APPLICATIONS TO MILITARY PILOT DECISION AIDING - A PERSPECTIVE ON TRANSITION
W. G. JAMES (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 19-24.
(SAE PAPER 841533)

The process of transition of the Pilot Decision Aiding AI technology to operational application is discussed in the framework of various R&D programs. The experience of implementing the 'intent-driven' cockpit technology in a Coast Guard helicopter and in simulation and flight test programs is described. A priority list of the subsystems and activities sufficiently mature for early automation and decision aiding is given, and the three consecutive steps to be taken for the transition ('Imitate', 'Embellish', and 'Fully Exploit') are explained. The importance of an airborne development program that precedes the flight evaluation program is emphasized. I.S.

A86-26005
AUTOMATION IN THE COCKPIT - WHO'S IN CHARGE?
R. W. MOSS, J. M. REISING, and N. R. HUDSON (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 25-29. refs
(SAE PAPER 841534)

This paper discusses levels of automation and decision making and arrives at an overall design philosophy for allocating tasks to the pilot and the computer. In order to produce a levels of automation matrix three categories of pilot-computer interface (pilot only, blended, and computer only) and three types of goals, (mission, functional and task), are identified. These two dimensions are then used to create a matrix which can be employed as a means of comparing automated systems. The options that the matrix produces are discussed and examples given. The overall design philosophy is to have the mission goals accomplished in a blended manner with both the pilot and computer contributing. Lower level goals are handled exclusively by the computer. The reasoning for this philosophy is to allow the pilot to operate in a rule-based environment so that he can optimally cope with the greatly increased amounts of information he will face in future missions. Author

A86-26009
EFFECT OF VIBRATION ON THE READABILITY OF COLOR CRT DISPLAYS
L. IVEY (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 53-59. refs
(SAE PAPER 841466)

The readability of symbols on a color CRT display in a vibrational environment equivalent to low-level flights was rated by eight aircraft personnel subjects undergoing tests in a Sixmode motion simulator. The differences in the values of the chrominance and luminance between static and vibrational conditions were determined. In addition, the impact of wearing protective PLZT goggles was evaluated. The comfortable viewing zone for the normal (non-PLZT) case was between 2.5 and 6.5 Hz, whereas the zone with PLZT was between 3 and 6.5 Hz. The colors and symbol changes caused by the applied vibration were acceptable, indicating the stability of the Sperry CRT shadow mask. The legibility data indicate that in a vibration environment, a minimum symbol size of greater than 0.12 in. is necessary. The digital update rate change should be between 3 and 5 Hz for the most comfortable viewing and the least errors. I.S.

A86-26016
A REVIEW OF PILOT WORKLOAD MEASUREMENT TECHNIQUES USED ON THE A-10 SINGLE SEAT NIGHT ATTACK TEST PROGRAM
C. D. CRITES (USAF, Human Factors Branch, Edwards AFB, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 107-112.
(SAE PAPER 841492)

A three-phase flight test program to evaluate the A-10 Single Seat Night Attack (SSNA) aircraft was conducted at the Air Force Flight Test Center (AFFTC), Edwards AFB, CA. An important objective of the SSNA testing was to assess, and where possible, measure pilot workload. The techniques utilized during the test program to quantify workload were: an objective measurement of task performance, control activity, and physiological status data, and the Subjective Workload Assessment Technique (SWAT). The use of objective techniques represented the first application in a flight test environment and an initial attempt to validate their use as work-load metrics. Both objective and subjective methods were of significant value, but both techniques had limitations and shortfalls. Lessons learned affecting the application of the techniques to on-going and future flight test programs are described. Author

A86-26018
ADVANCED FIGHTER TECHNOLOGY INTEGRATION (AFTI) F-16 - THE PILOT INTERFACE
D. R. MCMONAGLE (USAF, Flight Test Center, Edwards AFB, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 121-125.
(SAE PAPER 841633)

The aspects of the pilot-vehicle interphase in the two first phases of the Advanced Fighter Technology Integration (AFTI)/F-16 Program, which was designed to develop and demonstrate technologies and alternatives for future fighter aircraft design, are discussed. The results of the first AFTI phase, the Digital Flight Control System, indicated the need for multiple flight control mode capability in future multirole fighter aircraft. The second phase of the Program, the Automated Maneuvering Attack System, which began in July 1984, involves the development and evaluation of improved sensors, integrated fire and flight control for automated maneuvering weapon delivery, and enhancements in pilot-vehicle interface. I.S.

A86-26022
WINGING IT IN THE 1980'S - WHY GUIDELINES ARE NEEDED FOR COCKPIT AUTOMATION
M. R. HOAGLAND (Air Line Pilots Association, International, Washington, DC) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 155-162. refs
(SAE PAPER 841634)

There have been many reasons for the introduction of automation into the cockpit of the modern airliner. In some cases the forces driving technology have caused the design of automated systems which compromise the ability of the pilot to fulfill his responsibilities for the safety of the airplane under his command. This paper examines how these forces can lead to unnecessary cockpit automation, and discusses what must be done to avoid the introduction of automated systems which have the effect of removing the human operator from the information and control processes. Author

A86-26023
SITUATION VERSUS COMMAND
J. G. OLIVER (Air Line Pilots Association, International, Washington, DC) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 163-165.
(SAE PAPER 841638)

Two types of flight information are provided to pilots, situational and command. Situation information tells the pilot the state of the aircraft and its flight path while command information tells the pilot what to do and is not related to any given situation. This paper discusses why it is extremely important for the pilot to be provided with appropriate and adequate situation information in all aircraft but especially in modern highly-automated aircraft. Author

A86-26028
U.S. ARMY HELICOPTER VOICE TECHNOLOGY APPLICATIONS
F. J. MALKIN (U.S. Army, Human Engineering Laboratory, Aberdeen Proving Ground, MD) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 207-211. refs
(SAE PAPER 841609)

Voice technology provides a potential for alleviating the extremely high visual and manual workload of Army helicopter pilots. Before voice technology can be successfully employed in the cockpit, there are many human factors issues that must be resolved. This paper describes the approach used to identify potential applications of voice technology in an Army helicopter and the emulation of a voice interactive Doppler navigation set. Author

A86-26030* Psycho-Linguistic Research Associates, Menlo Park, Calif.
COMPARISON OF VOICE TYPES FOR HELICOPTER VOICE WARNING SYSTEMS
C. A. SIMPSON, K. MARCHIONDA-FROST, and T. NAVARRO (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 217-224. Army-supported research. refs
(Contract NAS2-11341)
(SAE PAPER 841611)

Three related studies were conducted to compare different types of human voice warnings. In the first study, a comparison of three LPC-encoded voices, human female, human male, and phoneme-synthesized, by the criteria of pilot flight task performance showed no differences due to the voice type. In the second study, pilots' preferences were investigated, by comparing preference for direct synthesized speech to the LPC-encoded human female speech and to LPC-encoded synthesized speech. Most pilots were found to prefer direct synthesized speech over both LPC-encoded human female speech and the LPC-encoded synthesized speech. In the third study, phonetically balanced (PB) words heard in simulated helicopter noise were used to compare the intelligibility of direct synthesized and LPC-encoded phoneme-synthesized speech types. PB word intelligibility was found to be better for direct synthesized speech than for the LPC-encodes synthesized speech. I.S.

A86-26031
ADVANCED TECHNOLOGY - NEW FIXES OR NEW PROBLEMS?
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Aerospace Behavioral Engineering Technology Conference, 3rd, Long Beach, CA, October 15-18, 1984, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1984, p. 225-236. refs

The principles of application of voice technology to cockpit control and display systems, the advantages of its use and the pitfalls of its misuse or overuse are discussed. The omnidirectionality and the sequential nature of speech imply the general requirements of short sentences, the minimal number of multiple messages, and avoidance of concurrent messages in the use of voice for both display and command purposes. To be of an advantage to the pilot, the use of voice displays must be limited to time-critical flight information, and the use of voice control must be limited to time-critical operations, both at the time when the pilot is visually or manually occupied to the extent that the voice display/command will reduce his workload. Especially important will be an integrated design of all voice controls and displays in order to avoid overloading the pilot with multiple messages and required control inputs, in a transmission mode that is essentially a single-channel system. I.S.

N86-18988 Department of the Navy, Washington, D. C.
SERVO OPERATED ANTI-G SUIT PRESSURIZATION SYSTEM Patent
R. J. CROSBIE and P. R. EDWARDS, inventors (to Navy) 13 Aug. 1985 7 p Supersedes AD-D011468
(AD-D011932; US-PATENT-4,534,338; US-PATENT-APPL-SN-613497; US-PATENT-CLASS-128-1)
Avail: US Patent and Trademark Office CSCL 06Q

A servo operated system for controlling pressurization of an aircraft pilot's anti-G suit during high energy maneuvers has a servo operated control valve and a feedback loop controller for minimizing pressure lag in the suit. The controller has dual modes of operation: one for normal flight conditions and one for combat flight conditions. The normal flight mode provides nominal G-protection while the combat mode provides faster response by prepressurizing the anti-G suit to a base level and lowering the G-force threshold. While in the combat mode, the crewman may select an adjustment pulsating signal to be superimposed on the prepressurization level to obtain additional comfort. Alternatively, he may select a superimposed pulsating signal which is synchronized with his own heartbeat to reinforce the pumping action of the heart. GRA

N86-18989* Naval Coastal Systems Center, Panama City, Fla.
DESIGN GUIDELINES FOR CARBON DIOXIDE SCRUBBERS, REVISION A
M. L. NUCKOLS, A. PURER, and G. A. DEASON Jul. 1985 77 p
(AD-A160181; NCSC-TECH-MAN-4110-1-83-REV-A) Avail: NTIS HC A05/MF A01 CSCL 06K

Design data and guidelines are presented to help predict the performance of axial flow carbon dioxide canister designs using alkali metal hydroxide absorbers. The design data are derived from a large series of laboratory tests conducted at the Naval Coastal Systems Center to isolate the effects of environmental and goemetric parameters on canister absorption efficiency. Sample canister designs are considered to demonstrate the use

of the derived data to predict effective canister life and pressure drop levels. Alternative techniques for the sorption of carbon dioxide are also reviewed. GRA

N86-18990*# California Univ., San Diego. Space Inst.
INDEPENDENT STUDY OF AUTOMATION AND ROBOTICS FOR THE NATIONAL SPACE PROGRAM BY THE AUTOMATION AND ROBOTICS PANEL
25 Feb. 1985 138 p
(Contract NAGW-629)
(NASA-CR-176523; NAS 1.26:176523; DE85-902185; CSI-85-01)
Avail: NTIS HC A07/MF A01 CSCL 05H

Methods are suggested for promoting continual growth in space station automation and robotics. Initial operation capability (IOC) space station design criteria are emphasized that will allow for ever-increasing levels of automation. The required technology advancement in robotics are described. The need is explained for improved human-machine interfaces, manipulators and sensors, and their combination with Earth developed robot technology into hybrid systems. The needed research base in computer science, artificial intelligence, and applied mathematics is discussed. Effects on private and Government Sectors are explained. It is shown that the Station will provide broader opportunities in time, space and society. Organizational recommendations are given for meeting Congressional goals for space station automation and robotics. DOE

N86-19906*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS: CELSS 1985 WORKSHOP
R. D. MACELROY, ed., N. V. MARTELLO, ed., and D. T. SMERNOFF, ed. Jan. 1986 624 p refs Workshop held at Moffett Field, Calif., 16-19 Jul. 1985
(NASA-TM-88215; A-86132; NAS 1.15:88215) Avail: NTIS HC A99/MF A01 CSCL 06K

Various topics related to closed ecological systems are discussed. Space habitats, vegetative growth, photosynthesis, recycling, culture techniques, waste utilization bioreactors and controlled atmospheres on space stations are among the topics covered.

N86-19907*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Sciences.
POTENTIAL FOR UTILIZATION OF ALGAL BIOMASS FOR COMPONENTS OF THE DIET IN CELSS
A. R. KAMAREI, Z. NAKHOST, and M. KAREL *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 13-22 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell Density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances is potential nutritional and organoleptic acceptability as a diet component in controlled Ecological Life Support System. Author

N86-19908*# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
BLSS, A EUROPEAN APPROACH TO CELSS
A. I. SKOOG *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 23-33 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Several studies have revealed the benefits of a biological life support system (BLSS) in space stations. Problem areas requiring experimental and analytical investigations necessary for the development of BLSS have been identified. The nature of these problems allows for the classification into near-term (prepilot) and long-term (pilot) studies, and into terrestrial and space research programmes. The knowledge of planned European and U.S. space experiments allows for a coordination with existing Spacelab and Shuttle programmes to avoid duplication of research efforts. The Japanese also plan biological experiments on Spacelab in 1988. Coordinating efforts should provide answers to certain BLSS relevant questions. Major areas which need immediate attention are: micorgravity effects; cosmic radiation effects; use of PAR-radiation and high energy particle radiation protection; and monitoring and control (including sensor technology). R.J.F.

N86-19909*# National Aerospace Lab., Tokyo (Japan).
CELSS EXPERIMENT MODEL AND DESIGN CONCEPT OF GAS RECYCLE SYSTEM
K. NITTA, M. OGUCHI, and S. KANDA (Kawasaki Heavy Industries Ltd., Kobe, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 35-46 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

In order to prolong the duration of manned missions around the Earth and to expand the human existing region from the Earth to other planets such as a Lunar Base or a manned Mars flight mission, the controlled ecological life support system (CELSS) becomes an essential factor of the future technology to be developed through utilization of space station. The preliminary system engineering and integration efforts regarding CELSS have been carried out by the Japanese CELSS concept study group for clarifying the feasibility of hardware development for Space station experiments and for getting the time phased mission sets after FY 1992. The results of these studies are briefly summarized and the design and utilization methods of a Gas Recycle System for CELSS experiments are discussed. Author

N86-19910*# Yokohama National Univ. (Japan). Dept. of Chemical Engineering.
UTILIZATION OF MEMBRANES FOR H2O RECYCLE SYSTEM
H. OHYA and M. OGUCHI (National Aerospace Lab., Tokyo, Japan) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 47-53 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Conceptual studies of closed ecological life support systems (CELSS) carried out at NAL in Japan for a water recycle system using membranes are reviewed. The system will treat water from shower room, urine, impure condensation from gas recycle system, and so on. The H2O recycle system is composed of prefilter, ultrafiltration membrane, reverse osmosis membrane, and distillator. Some results are shown for a bullet train of toilet-flushing water recycle equipment with an ultraviltration membrane module. The constant value of the permeation rate with a 4.7 square meters of module is about 70 1/h after 500th of operation. Thermovaporization with porous polytetrafluorocarbon membrane is also proposed to replce the distillator. Author

N86-19911*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
THE C23A SYSTEM, AN EXMAPLE OF QUANTITATIVE CONTROL OF PLANT GROWTH ASSOCIATED WITH A DATA BASE
M. ANDRE, A. DAGUENET, D. MASSIMINO, and A. GERBAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 55-64 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The architecture of the C23A (Chambers de Culture Automatique en Atmosphere Artificielles) system for the controlled study of plant physiology is described. A modular plant growth chambers and associated instruments (I.R. CO2 analyser, Mass spectrometer and Chemical analyser); network of frontal processors controlling this apparatus; a central computer for the periodic control and the multiplex work of processors; and a network of terminal computers able to ask the data base for data processing and modeling are discussed. Examples of present results are given. A growth curve analysis study of CO2 and O2 gas exchanges of shoots and roots, and daily evolution of algal photosynthesis and of the pools of dissolved CO2 in sea water are discussed. R.J.F.

N86-19912*# Messerschmitt-Boelkow-Blohm G.m.b.H., Bremen (West Germany). Raumfahrttechnik G.m.b.H.

DESCRIPTION OF CONCEPT AND FIRST FEASIBILITY TEST RESULTS OF A LIFE SUPPORT SUBSYSTEM OF THE BOTANY FACILITY BASED ON WATER RECLAMATION

H. R. LOESER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 65-76 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The Botany Facility allows the growth of higher plants and fungi over a period of 6 months maximum. It is a payload planned for the second flight of the Eureca platform around 1990. Major tasks of the Life Support Subsystem (LSS) of the Botany Facility include the control of the pressure and composition of the atmosphere within the plant/fungi growth chambers, control of the temperature and humidity of the air and the regulation of the soil water content within specified limits. Previous studies have shown that various LSS concepts are feasible ranging from heavy, simple and cheap to light, complex and expensive solutions. A summary of those concepts is given. A new approach to accomplish control of the temperature and humidity of the air within the growth chambers based on water reclamation is discussed. This reclamation is achieved by condensation with a heat pump and capillary transport of the condensate back into the soil of the individual growth chamber Some analytical estimates are given in order to obtain guidelines for circulation flow rates and to determine the specific power consumption. R.J.F.

N86-19914*# North Carolina State Univ., Raleigh. Dept. of Soil Science.

SIMULATION MODEL FOR PLANT GROWTH IN CONTROLLED ENVIRONMENT SYSTEMS

C. D. RAPER, JR. and M. WANN *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 85-101 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The role of the mathematical model is to relate the individual processes to environmental conditions and the behavior of the whole plant. Using the controlled-environment facilities of the phytotron at North Carolina State University for experimentation at the whole-plant level and methods for handling complex models, researchers developed a plant growth model to describe the relationships between hierarchial levels of the crop production system. The fundamental processes that are considered are: (1) interception of photosynthetically active radiation by leaves, (2) absorption of photosynthetically active radiation, (3) photosynthetic transformation of absorbed radiation into chemical energy of carbon bonding in solube carbohydrates in the leaves, (4) translocation between carbohydrate pools in leaves, stems, and roots, (5) flow of energy from carbohydrate pools for respiration, (6) flow from carbohydrate pools for growth, and (7) aging of tissues. These processes are described at the level of organ structure and of elementary function processes. The driving variables of incident photosynthetically active radiation and ambient temperature as inputs pertain to characterization at the whole-plant level. The output of the model is accumulated dry matter partitioned among leaves, stems, and roots; thus, the elementary processes clearly operate under the constraints of the plant structure which is itself the output of the model. R.J.F.

N86-19915*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

PLAN FOR CELSS TEST BED PROJECT

W. M. KNOTT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 109-118 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

The Closed Ecological Life Support Systems (CELSS) testbed project will achieve two major goals: It will develop the knowledge and technology needed to build and test biological or combined biological physiochemical regenerative life support systems. It will fabricate, test, and operate ground based facilities to accomplish proof-of-concent testing and evaluation leading to flight experimentation. The project will combine basic research and applied research/engineering to achieve a phased, integrated development of hardware, systems, and techniques for food and oxygen production, food processing, and waste processing in closed systems. The project will design, fabricate, and operate within three years a botanical production system scaled to a sufficient size to verify oxygen and nutrient load production (carbohydrates, fats, proteins) at a useable level. It will develop within five years a waste management system compatible with the botanical production system and a food processing system that converts available biomass into edible products. It will design, construct, and operate within ten years a ground based candidate CELSS that includes man as an active participant in the system. It will design a flight CELSS module within twelve years and construct and conduct initial flight tests within fifteen years. R.J.F.

N86-19916*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.

PLANT GROWTH CHAMBER M DESIGN

R. P. PRINCE and W. M. KNOTT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 119-128 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Crop production is just one of the many processes involved in establishing long term survival of man in space. The benefits of integrating higher plants into the overall plan was recognized early by NASA through the Closed Ecological Life Support System (CELSS) program. The first step is to design, construct, and operate a sealed (gas, liquid, and solid) plant growth chamber. A 3.6 m diameter by 6.7 m high closed cylinder (previously used as a hypobaric vessel during the Mercury program) is being modified for this purpose. The chamber is mounted on legs with the central axis vertical. Entrance to the chamber is through an airlock. This chamber will be devoted entirely to higher plant experimentation. Any waste treatment, food processing or product storage studies will be carried on outside of this chamber. Its primary purpose is to provide input and output data on solids, liquids, and gases for single crop species and multiple species production using different nutrient delivery systems. R.J.F.

N86-19917*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

OPERATIONAL DEVELOPMENT OF SMALL PLANT GROWTH SYSTEMS

H. W. SCHELD (PhytoResource Research, Inc., College Station, Tex.), J. W. MAGNUSON (PhytoResource Research, Inc., College Station, Tex.), and R. L. SAUER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 129-150 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of a study undertaken on the first phase of an empricial effort in the development of small plant growth chambers for production of salad type vegetables on space shuttle or space station are discussed. The overall effort is visualized as providing the underpinning of practical experience in handling of plant systems in space which will provide major support for future efforts in planning, design, and construction of plant-based (phytomechanical) systems for support of human habitation in space. The assumptions underlying the effort hold that large scale phytomechanical habitability support systems for future space stations must evolve from the simple to the complex. The highly complex final systems will be developed from the accumulated experience and data gathered from repetitive tests and trials of fragments or subsystems of the whole in an operational mode. These developing system components will, meanwhile, serve a useful operational function in providing psychological support and diversion for the crews. R.J.F.

N86-19918*# New Hampshire Univ., Durham. Complex Systems Research Center.
ELECTROCHEMICAL CONTROL OF PH IN A HYDROPONIC NUTRIENT SOLUTION
S. H. SCHWARTZKOPF *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 151-158 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The electrochemical pH control system described was found to provide a feasible alternative method of controlling nutrient solution pH for CELSS applications. The plants grown in nutrient solution in which the pH was controlled electrochemically showed no adverse effects. Further research into the design of a larger capacity electrode bridge for better control is indicated by the results of this experiment, and is currently under way. Author

N86-19919*# Battelle Columbus Labs., Ohio.
AN ENGINEERING ANALYSIS OF A CLOSED CYCLE PLANT GROWTH MODULE
G. H. STICKFORD, JR., F. E. JAKOB, and D. K. LANDSTROM *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 159-181 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The SOLGEM model is a numerical engineering model which solves the flow and energy balance equations for the air flowing through a growing environment, assuming quasi-steady state conditions within the system. SOLGEM provides a dynamic simulation of the controlled environment system in that the temperature and flow conditions of the growing environment are estimated on an hourly basis in response to the weather data and the plant growth parameters. The flow energy balance considers the incident solar flux; incoming air temperature, humidity, and flow rate; heat exchange with the roof and floor; and heat and moisture exchange with the plants. A plant transpiration subroutine was developed based plant growth research facility, intended for the study of bioregenerative life support theories. The results of a performance analysis of the plant growth module are given. The estimated energy requirements of the module components and the total energy are given. R.J.F.

N86-19920*# National Aerospace Lab., Tokyo (Japan).
GAS AND WATER RECYCLING SYSTEM FOR IOC VIVARIUM EXPERIMENTS
K. NITTA and K. OTSUBO *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 185-200 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Water and gas recycling units designed as one of the common experiment support system for the life science experiment facilities used in the Japanese Experiment Module are discussed. These units will save transportation and operation costs for the life science experiments in the space station. These units are also designed to have interfaces so simple that the connection to another life science experiment facilities such as the Research Animal Holding Facility developed by the Rockheed Missiles and Space Company can be easily done with small modification. R.J.F.

N86-19921*# National Aerospace Lab., Tokyo (Japan).
WATER RECYCLING SYSTEM USING THERMOPERVAPORATION METHOD
K. NITTA, A. ASHIDA (Hitachi Ltd., Tokyo, Japan), K. MITANI (Hitachi Ltd., Tokyo, Japan), K. EBARA (Hitachi Ltd., Tokyo, Japan), and A. YAMADA *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 201-225 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A water recycling system concept for the crew of the space station is presented. A thermopervaporation method is a new key technology used for the distillation process, utilizing a hydrophobic membrane. An experimental study of thermopervaporation revealed that the permeation depends on the gap between the membrane and the cooling surface in the condensation room: the steam diffusion occurs with gaps less than 5 mm while natural convection becomes dominant with gaps more than 5 mm. A brief discussion of the system operation is also described. Author

N86-19922*# MODEC, Cambridge, Mass.
SUPERCRITICAL WASTE OXIDATION OF AQUEOUS WASTES
M. MODELL *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 227-251 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 07B

For aqueous wastes containing 1 to 20 wt% organics, supercritical water oxidation is less costly than controlled incineration or activated carbon treatment and far more efficient than wet oxidation. Above the critical temperature (374 C) and pressure (218 atm) of water, organic materials and gases are completely miscible with water. In supercritical water oxidation, organics, air and water are brought together in a mixture at 250 atm and temperatures above 400 C. Organic oxidation is initiated spontaneously at these conditions. The heat of combustion is released within the fluid and results in a rise in temperature 600 to 650 C. Under these conditions, organics are destroyed rapidly with efficiencies in excess of 99.999%. Heteroatoms are oxidized to acids, which can be precipitated out as salts by adding a base to the feed. Examples are given for process configurations to treat aqueous wastes with 10 and 2 wt% organics. Author

N86-19923*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AIRBORNE TRACE CONTAMINANTS OF POSSIBLE INTEREST IN CELSS
J. S. GARAVELLI *In its* Controlled Ecological Life Support Systems p 253-262 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

One design goal of Closed Ecological Life Support Systems (CELSS) for long duration space missions is to maintain an atmosphere which is healthy for all the desirable biological species and not deleterious to any of the mechanical components in that atmosphere. CELESS design must take into account the interactions of at least six major components; (1) humans and animals, (2) higher plants, (3) microalgae, (4) bacteria and fungi, (5) the waste processing system, and (6) other mechanical systems. Each of these major components can be both a source and a target of airborne trace contaminants in a CELSS. A range of possible airborne trace contaminants is discussed within a chemical classification scheme. These contaminants are analyzed with respect to their probable sources among the six major components and their potential effects on those components. Data on airborne chemical contaminants detected in shuttle missions is presented along with this analysis. The observed concentrations of several classes of compounds, including hydrocarbons, halocarbons, halosilanes, amines and nitrogen oxides, are considered with respect to the problems which they present to CELSS. Author

N86-19924*# New Hampshire Univ., Durham. Complex Systems Research Center.
OBSERVATIONS ON GAS EXCHANGE AND ELEMENT RECYCLE WITHIN A GAS-CLOSED ALGAL-MOUSE SYSTEM
D. T. SMERNOFF, R. A. WHARTON, JR., and M. M. AVERNER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 263-280 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Life support systems based on bioregeneration rely on the control and manipulation of organisms. Algae are potentially useful for a variety of Closed Ecological Life Support System (CELSS) functions including the revitalization of atmospheres, production of food and for nitrogen fixation. The results of experiments conducted with a gas-closed algal-mouse system designed to investigate gas exchange phenomena under varying algal environmental conditions, and the ability of algae to utilize oxidized mouse solid waste are reported. Inherent instabilities exist between the uptake and release of carbon dioxide (CO2) and oxygen (O2) by the mouse and algae in a gas-closed system. Variations in light intensity and cell density alter the photosynthetic rate of the algae and enable short-term steady-state concentrations of atmospheric CO2 and O2. Different nitrogen sources (urea and

nitrate) result in different algal assimilatory quotients (AQ). Combinations of photosynthetic rate and AQ ratio manipulations were examined for their potential in stabilizing atmospheric gas concentrations in the gas-closed algal-mouse system. R.J.F.

N86-19925*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CELSS SCIENCE NEEDS
J. D. RUMMEL *In its* Controlled Ecological Life Support Systems p 281-284 Jan. 1986
Avail: NTIS HC A99/MF A01 CSCL 06K

Questions and areas of study that need to be persued in order to develope a Controlled Ecological Life Support System are posed. Research topics needing attention are grouped under various leadings: ecology, genetics, plant pathology, cybernetics, chemistry, computer science, fluid dynamics, optics, and solid-state physics. R.J.F.

N86-19926*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DESIGN CONCEPTS FOR BIOREACTORS IN SPACE
P. K. SESHAN, G. R. PETERSON, B. BEARD (Washington Univ., St. Louis, Mo.), and E. H. DUNLOP (Washington Univ., St. Louis, Mo.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 287-313 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Microbial food sources are becoming viable and more efficient alternatives to conventional food sources especially in the context of Closed Ecological Life Support Systems (CELSS) in space habitats. Since bioreactor designs for terrestrial operation will not readily apply to conditions of microgravity, there is an urgent need to learn about the differences. These differences cannot be easily estimated due to the complex nature of the mass transport and mixing mechanisms in fermenters. Therefore, a systematic and expeditious experimental program must be undertaken to obtain the engineering data necessary to lay down the foundations of designing bioreactors for microgravity. Two bioreactor design concepts presented represent two dissimilar approaches to grappling with the absence of gravity in space habitats and deserve to be tested for adoption as important components of the life support function aboard spacecrafts, space stations and other extra-terrestrial habitats. R.J.F.

N86-19927*# Martin Marietta Corp., Baltimore, Md.
AN ANALYSIS OF THE PRODUCTIVITY OF A CELSS CONTINUOUS ALGAL CULTURE SYSTEM
R. RADMER, P. BEHRENS, E. FERNANDEZ, and K. ARNETT *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 315-328 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

One of the most attractive aspects of using algal cultures as plant components for a Closed Ecological Life Support Systems (CELSS) is the efficiency with which they can be grown. Although algae are not necessarily intrinsically more efficient than higher plants, the ease which they can be handled and manipulated (more like chemical reagents than plants), and the culturing techniques available, result in much higher growth rates than are usually attainable with higher plants. Furthermore, preliminary experiments have demonstrated that algal growth and physiology is not detectable altered in a microgravity environment, (1) whereas the response of higher plants to zero gravity is unknown. In order to rationally design and operate culture systems, it is necessary to understand how the macroparameters of a culture system, e.g., productivity, are related to the physiological aspects of the algal culture. A first principles analysis of culture system is discussed, and a mathematical model that describes the relationship of culture productivity to the cell concentration of light-limited culture is derived. The predicted productivity vs cell concentration curve agrees well with the experimental data obtained to test this model, indicating that this model permits an accurate prediction of culture productivity given the growth parameters of the system. R.J.F.

N86-19928*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE DEVELOPMENT OF AN UNCONVENTIONAL FOOD REGENERATION PROCESS: QUANTIFYING THE NUTRITIONAL COMPONENTS OF A MODEL METHYLOTROPHIC YEAST
G. R. PETERSEN and B. O. STOKES (Biomass International, Ogden, Utah) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 329-338 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A hybrid chemical/biological approach to unconventional food regeneration is discussed. Carbon dioxide and water, the major wastes of human metabolism would be converted to methanol by one of several physiochemical processes available (thermal, photocatalytic, etc.). Methanol is then used to supply carbon and energy for the culture of microorganisms which in turn produce biological useful basic food stuffs for human nutrition. Our work has focused on increasing the carbohydrate levels of a candidate methylotrophic yeast to more nearly coincide with human nutritional requirements. Yeasts were chosen due to their high carbohydrate levels compared to bacteria and their present familiarity in the human diet. The initial candidate yeast studied was a thermotolerant strain of Hansenula polymor pha, DL-1. The quantitative results that permit an evaluation of the overall efficiency in hybrid chemical/biological food production schemes are discussed. A preliminary evaluation of the overall efficiency of such schemes is also discussed. R.J.G.

N86-19929*# California Univ., Berkeley. Lawrence Berkeley Lab. Membrane Bioenergetics Group.
APPLICATION OF PHOTOSYNTHETIC N2-FIXING CYANOBACTERIA TO THE CELSS PROGRAM
L. PACKER, I. FRY, and S. BELKIN *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 339-352 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Commercially available air lift fermentors were used to simultaneously monitor biomass production, N2-fixation, photosynthesis, respiration, and sensitivity to oxidative damage during growth under various nutritional and light regimes, to establish a data base for the integration of these organisms into a Closed Ecological Life Support System (CELSS) program. Certain cyanobacterial species have the unique ability to reduce atmospheric N2 to organic nitrogen. These organisms combine the ease of cultivation characteristics of prokaryotes with the fully developed photosynthetic apparatus of higher plants. This, along with their ability to adapt to changes in their environment by modulation of certain biochemical pathways, make them attractive candidates for incorporation into the CELSS program. R.J.F.

N86-19930*# Cornell Univ., Ithaca, N.Y. School of Chemical Engineering.
CARBON DIOXIDE EVOLUTION RATE AS A METHOD TO MONITOR AND CONTROL AN AEROBIC BIOLOGICAL WASTE TREATMENT SYSTEM
S. S. LEE and M. L. SHULER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 354-391 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

An experimental system was developed to study the microbial growth kinetic of an undefined mixed culture in an erobic biological waste treatment process. The experimental results were used to develop a mathematical model that can predict the performance of a bioreactor. The bioreactor will be used to regeneratively treat waste material which is expected to be generated during a long term manned space mission. Since the presence of insoluble particles in the chemically undefined complex media made estimating biomass very difficult in the real system, a clean system was devised to study the microbial growth from the soluble substrate. R.J.F.

N86-19931*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
CAN PLANTS GROW IN QUASI-VACUUM?
M. ANDRE and C. RICHAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 395-404 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

It was found that the growth of plants is possible under absolute pressure 14 times lower than the atmospheric pressure. In first approximation, plants ignore the absence of nitrogen and only react to the partial pressure of O2. Hence the growth of plantlets was delayed under low pressures of O2 in both cases with and without nitrogen. The CO2 availability being limited by the carbon content of the seed, the final results after 20 days were very similar. R.J.F.

N86-19932*# Commissariat a l'Energie Atomique, Cadarache (France). Service de Radioagronomie.
WHEAT RESPONSE TO CO2 ENRICHMENT: CO2 EXCHANGES TRANSPIRATION AND MINERAL UPTAKES
M. ANDRE, H. DUCLOUX, and C. RICHAUD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 405-428 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

When simulating canopies planted in varied densities, researchers were able to demonstrate that increase of dry matter production by enhancing CO2 quickly becomes independant of increase of leaf area, especially above leaf area index of 2; dry matter gain results mainly from photosynthesis stimulation per unit of surface (primary CO2 effect). When crop density is low (the plants remaining alone a longer time), the effects of increasing leaf surface (tillering, leaf elongation here, branching for other plants etc.) was noticeable and dry matter simulation factor reached 1.65. This area effect decreased when canopy was closed in, as the effect of different surfaces no longer worked. The stimulation of photosynthesis reached to the primary CO2 effect. The accumulation in dry matter which was fast during that phase made the original weight advantage more and more neglectible. Comparison with short term measurements showed that first order long term effect of CO2 in wheat is predictible with short term experiment, from the effect of CO2 on photosynthesis measured on reference sample. R.J.F.

N86-19933*# California Univ., Davis. Plant Growth Lab.
EFFECTS OF NO3(-) AND NH4(+) AND UREA ON EACH OTHER'S UPTAKE AND INCORPORATION
R. C. HUFFAKER and M. R. WARD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 429-445 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The purpose was to determine the optimal use by wheat plants of the N sources expected from processing biological waste products, NO3(-),NO2(-)NH4(+), and urea. The approach was to determine the uptake and metabolic products of each N source (from single and multiple component solutions), inhibitory effects of each, feedback inhibition, and overall in vivo regulation of the rates of assimilation of each by wheat plants. Previously, researchers determined the interactions of NO3(-),NO2(-),NH4(+) on each other's uptake and incorporation. The assimilation and some of its effects on NO3(-) and NH4(+) assimilation which have been completed to data are discussed. R.J.F.

N86-19934*# Utah State Univ., Logan. Plant Science Dept.
STUDIES ON MAXIMUM YIELD OF WHEAT FOR THE CONTROLLED ENVIRONMENTS OF SPACE
B. G. BUGBEE and F. B. SALISBURY *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 447-485 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The economic feasibility of using food-producing crop plants in a closed ecological Life-Support System (CELSS) will ultimately depend on the energy and area (or volume) required to provide the nutritional requirements for each person. Energy and area requirements are, to some extent, inversely related; that is, an increased energy input results in a decreased area requirement and vice versa. A major goal of the research effort was to determine the controlled-environment good-production efficiency of wheat per unit area, per unit time, and per unit energy input. R.J.F.

N86-19935*# Wisconsin Univ., Madison. Dept. of Horticulture.
UTILIZATION OF POTATOES IN CELSS: PRODUCTIVITY AND GROWING SYSTEMS
T. W. TIBBITTS *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 487-498 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The potato plant (solanum tuberosum L.) is one of the basic food crops that should be studied for use in NASA's closed Ecological Life Support System (CELSS). It offers high yields per unit area and time, with most of this production in the form of highly digestible carbohydrate. Potatoes, like wheat and rice, are particularly useful in human diets because of their nutritional versatility and ease of processing and preparation. The growth of the potato was studied and it was found to be a useful species for life support systems. R.J.F.

N86-19936*# Purdue Univ., West Lafayette, Ind. Dept. of Horticulture.
OPTIMIZATION OF CONTROLLED ENVIRONMENTS FOR HYDROPONIC PRODUCTION OF LEAF LETTUCE FOR HUMAN LIFE SUPPORT IN CELSS
C. A. MITCHELL, S. L. KNIGHT, and T. L. FORD *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 499-521 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A research project in the food production group of the Closed Ecological Life Support System (CELSS) program sought to define optimum conditions for photosynthetic productivity of a higher plant food crop. The effects of radiation and various atmospheric compositions were studied. R.J.F.

N86-19937*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
CLOSED CULTURE PLANT STUDIES: IMPLICATIONS FOR CELSS
T. HOSHIZAKI *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 523-540 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Arabidopsis plants were grown in closed cultures similar to those used in space experiments. A shift in metabolism from photosynthesis to respiration is indicated by the accumulation of CO2 in the culture atmosphere. Reproductive growth is suppressed. Plant growth and development is apparently related to the atmospheric volume available to each plant. The implications of these findings to closed ecological systems are given: (1) there is a need for an open culture having ample gas exchange, (2) CO2 levels must be maintained within prescribed limits, (3) the minimum atmospheric volume required for each plant is dependent on the precision of the gas monitors and of the subsystems used to maintain appropriate levels of various atmospheric components, and (4) volatiles such as ethylene and terpenes emanating from plants be monitored and reduced to benign concentrations. R.J.F.

N86-19938*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A METHOD FOR SCREENING OF PLANT SPECIES FOR SPACE USE
J. D. GOESCHL (Phytokinetics, Inc., College Station, Tex.), R. L. SAUER, and H. W. SCHELD (PhytoResource Research, Inc., College Station, Tex.) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 541-554 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

A cost-effective methodology which monitors numerous dynamic aspects of carbon assimilation and allocation kinetics in live, intact plants is discussed. Analogous methods can apply to nitrogen

uptake and allocation. This methodology capitalizes on the special properties of the short-lived, positron-gamma emitting isotope C-11 especially when applied as CO2-11 in a special extended square wave (ESW) pattern. The 20.4 minute half-life allows for repeated or continuous experiments on the same plant over periods of minutes, hours, days, or weeks. The steady-state isotope equilibrium approached during the ESW experiments, and the parameters which can be analyzed by this technique are also direct results of that short half-life. Additionally, the paired .511 MeV gamma rays penetrate any amount of tissue and their 180 deg opposite orientation provides good collimation and allows coincidence counting which nearly eliminates background. R.J.F.

N86-19939*# Wisconsin Univ., Madison. Dept. of Horticulture.
POTATO LEAF EXPLANTS AS A SPACEFLIGHT PLANT TEST SYSTEM
R. M. WHEELER *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 555-564 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The use of explant tissues or organs may circumvent limitations facing whole-plant experimentation during spaceflight. In the case of potato, a crop currently being studied for application to bioregenerative life support systems, excised leaves and their subtended axillary buds can be used to test a variety of stem growth and development phases ranging from tubers through stolons (horizontal stems) to upright leafy shoots. The leaves can be fit well into small-volume test packages and sustained under relatively low irradiance levels using light-weight growing media. Tubers formed on potato leaf cuttings can yield up from 0.5 to 1.0 g fresh mass 10 days after excision and up to 2.0 g or more, 14 days from excision. Author

N86-19940*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECT OF ULTRADIAN AND ORBITAL CYCLES ON PLANT GROWTH
W. BERRY (California Univ., Los Angeles), T. HOSHIZAKI, and A. ULRICH (California Univ., Berkeley) *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 565-575 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

In a series of experiments using sugar beets, researchers investigated the effects of varying cycles lengths on growth (0.37 hr to 48 hr). Each cycle was equally divided into a light and dark period so that each treatment regardless of cycle length received the same amount of light over the 17 weeks of the experiment. Two growth parameters were used to evaluate the effects of cycle length, total fresh weight and sucrose content of the storage root. Both parameters showed very similar responses in that under long cycles (12 hr or greater) growth was normal, whereas plants growing under shorter cycle periods were progressively inhibited. Minimum growth occurred at a cycle period of 0.75 hr. The yield at the 0.75 hr cycle, where was at a minimum, for total fresh weight was only 51 percent compared to the 24 hr cycle. The yield of sucrose was even more reduced at 41 percent of the 24 hr cycle. R.J.F.

N86-19941*# North Carolina State Univ., Raleigh. Dept. of Soil Science.
NITROGEN UPTAKE AND UTILIZATION BY INTACT PLANTS
C. D. RAPER, JR. and L. C. TOLLEY-HENRY *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 577-594 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The results of experiments support the proposed conceptual model that relates nitrogen uptake activity by plants as a balanced interdependence between the carbon-supplying function of the shoot and the nitrogen-supplying function of the roots. The data are being used to modify a dynamic simulation of plant growth, which presently describes carbon flows through the plant, to describe nitrogen uptake and assimilation within the plant system. Although several models have been proposed to predict nitrogen uptake and partitioning, they emphasize root characteristics affecting nutrient uptake and relay on empirical methods to describe the relationship between nitrogen and carbon flows within the plant. Researchers, on the other hand, propose to continue to attempt a mechanistic solution in which the effects of environment on nitrogen (as well as carbon) assimilation are incorporated through their direct effects on photosynthesis, respiration, and aging processes. R.J.F.

N86-19942*# North Dakota State Univ., Fargo. Dept. of Plant Pathology.
THE ROLE OF PLANT DISEASE IN THE DEVELOPMENT OF CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEMS
B. NELSON *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 595-610 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

Plant diseases could be important factors affecting growth of higher plants in Closed Ecological Life Support Systems (CELSS). Disease control, therefore, will be needed to maintain healthy plants. The most important controls should be aimed at preventing the introduction, reproduction and spread of pathogens and preventing plant infection. An integrared ease control program will maximize that approach. In the design and operation of CELSS, plant disease should be considered an important aspect of plant growth. The effects of plant diseases are reviewed and several disease control measures are discussed. R.J.F.

N86-19943*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DEVELOPMENT OF SPACE TECHNOLOGY FOR ECOLOGICAL HABITATS
N. V. MARTELLO *In* NASA. Ames Research Center Controlled Ecological Life Support Systems p 613-625 Jan. 1986 refs
Avail: NTIS HC A99/MF A01 CSCL 06K

The development of closed ecological systems for space stations is discussed. Growth chambers, control systems, microgravity, ecosystem stability, lighting equipment, and waste processing systems are among the topics discussed. R.J.F.

N86-19944# Navy Clothing and Textile Research Facility, Natick, Mass.
REFURBISHING SPRAY ON ALUMINUM ENAMEL ON PROXIMITY CLOTHING Final Technical Report, Oct. 1982 - Sep. 1983
H. WINER, J. WALKER, P. CAMPBELL, and J. CALFEE Jul. 1985 25 p
(Contract MIPR-N-82-29; DA PROJ. 250-5)
(AD-A159707; AFESC/ESL-TR-84-17) Avail: NTIS HC A02/MF A01 CSCL 06Q

The Navy Clothing and Textile Research Facility studied the effectiveness of refurbishing the aluminum coating on worn aluminized proximity firefighters' clothing. It was thought that, if a spray-on aluminum enamel could restore the surface aluminum coating to an acceptable level of infrared radiant heat reflectance, then the clothing could be worn for an extended period of time, reducing replacement costs. Vacuum-deposited aluminum fabric specimens were cut from worn firefighters' clothing and tested for their thermal transmission at three levels of heat flux. Before heat-testing, each specimen was identified as to its percentage of infrared reflectance at 1100 nanometers and, subjectively, by visually observing the worn aluminized surface. This report describes the laboratory investigation of two spray-on aluminum enamel coatings over worn aluminized fabric to obtain data that would allow a judgment as to their effectiveness, as well as the effectiveness of all spray-on aluminum enamel, to extend the use-life of proximity firefighters' clothing. GRA

N86-19945# Army Aeromedical Research Lab., Fort Rucker, Ala.
DYNAMICS OF HEAD PROTECTION (IMPACT PROTECTIVE COMPARISON OF THE SPH-4 FLIGHT HELMET TO A COMMERCIAL MOTORCYCLE HELMET)
R. F. ROLSTEN and J. L. HALEY, JR. Jul. 1985 37 p
(AD-A161164; USAARL-85-5) Avail: NTIS HC A03/MF A01
CSCL 06Q

The impact protection provided by a commercial motorcycle helmet is evaluated in this report. The motorcycle helmet utilizes an expanded plastic foam liner of 12 mm thickness, which is less than that used in most motorcycle helmets made in this country today. The thickness of the foam is identical to that used in the US Army Aviator's standard Sound Protective Helmet No. 4 (SPH-4). The impact protection provided by the commercial helmet is compared to the protection provided by the SPH-4 aviator helmet. GRA

N86-19946# Army Aeromedical Research Lab., Fort Rucker, Ala.
HELICOPTER-REFERENCED SINGLE CONTROL, CENTER-POSITION FORCE EXERTION CAPABILITIES OF MALES AND FEMALES Final Report
A. W. SCHOPPER and G. R. MASTROIANNI Aug. 1985 60 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A161234; USAARL-85-4) Avail: NTIS HC A04/MF A01
CSCL 06P

In response to the need for reevaluation of anthropometric criteria contained in the US Army medical standards for flying duty, an assessment was made of helicopter-control-referenced force exertion capabilities of a sample of Army males and females. Males (N=74) ranged from 159 cm through 196 cm in stature; females (N=66) ranged from 152 cm through 183 cm. The force-exertion data were compared to values cited in MIL-H-8501A as upper force limits for the design of helicopter controls. The focuses of the analyses were upon the force exertion capabilities of individuals 167 cm and below in stature since, by virtue of their relatively small size, they represent the portion of the population which are most apt to evidence inabilities to exert forces which equal or exceed control force design limits. The comparison revealed that, overall, the presently existing limits (published in 1961) for other-than-the normal operational flight envelope exceeded the force exertion capabilities of 10% of the 39 small males evaluated and 27% of the 56 females evaluated. Most failures to achieve existing or proposed control force design limits occurred because of inabilities to attain criterion-level exertion data from the small individuals of this study, various combinations of specific control force design limits were evaluated to develop estimations of overall set-wise failure rates likely to be encountered during possible future strength testing/screening. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-25774
SIGNS OF LIFE
G. CAIRNS-SMITH (Glasgow, University, Scotland) New Scientist (ISSN 0028-6664), vol. 109, Jan. 2, 1986, p. 34-36.

The question of how to recognize signs of life by analysis of molecules or structures detected in remote parts of the Universe, is discussed. It is believed that to be a life indicator, a set of molecules or objects must not only belong to a certain broad class, such as amino acids or sand particles, but also possess a set of common but complex and unique structures, not readily explicable in terms of normal physical and chemical processes. The principle of these criteria is illustrated by examples of theme molecules, in which the C, H, O, N, and Fe atoms have their unique places in the molecule, and seashells, in which the 'uniqueness' is obvious because of their uncommon but repeating forms. Both are found in multitudes and thus can be recognized as parts of reproducing entities, and both possess qualities of complexity and uniqueness, suggesting that there is or was a selective advantage for a particular structure. I.S.

A86-26198
ISOLEUCINE STEREOISOMERS ON THE EARTH
J. L. BADA, M. ZHAO (California, University, La Jolla), S. STEINBERG, and E. RUTH (California, University, Los Angeles) Nature (ISSN 0028-0836), vol. 319, Jan. 23, 1986, p. 314-316. Research supported by the Petroleum Research Fund. refs
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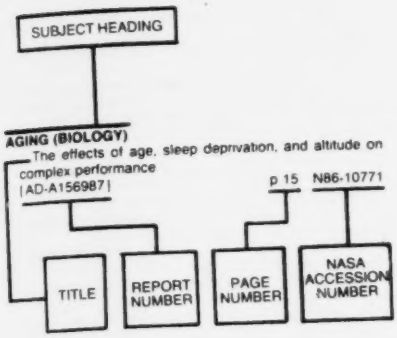
To assess whether the amino acids D-isoleucine and L-allo-isoleucine could be produced on earth by beta-epimerization of L-isoleucine (L-Ile) and D-allo-isoleucine (D-alle), the beta-epimerization rate was measured at 250 C in aqueous solution, and the isoleucine stereoisometric composition was determined in fossil mollusks of various geological ages. The aqueous solution measurements suggest that the ratio of the alpha and beta-epimerization rates of isoleucine is 1000-10,000 in the neutral pH region at 250 C. If this ratio is applicable to geochemical systems, then the isoleucine beta-epimerization rate should have a half-life of about 100 million to 100 billion yr on the earth's surface. This implies that little if any beta-epimerization of L-Ile and D-alle would occur even over the entire age of the earth. An apparently enhanced rate of isoleucine beta-epimerization is found in carbonate fossils; several factors which may produce this enhancement are suggested. C.D.

Typical Subject Index Listing



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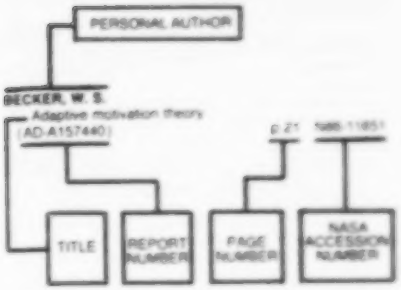

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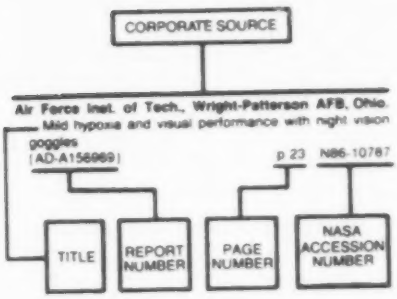

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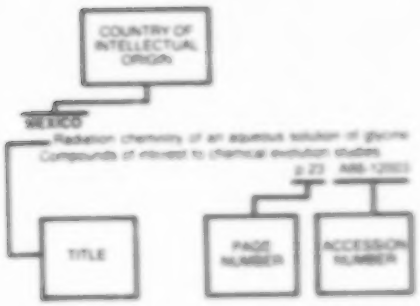

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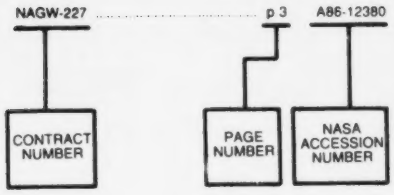

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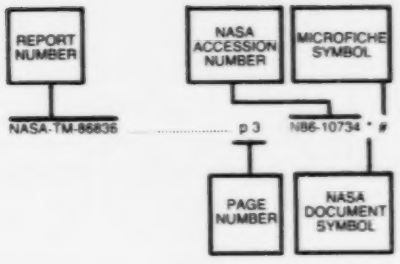

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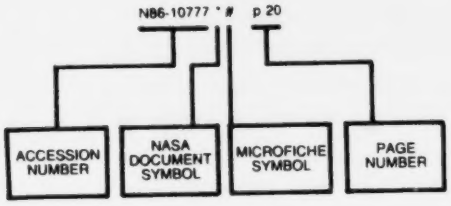

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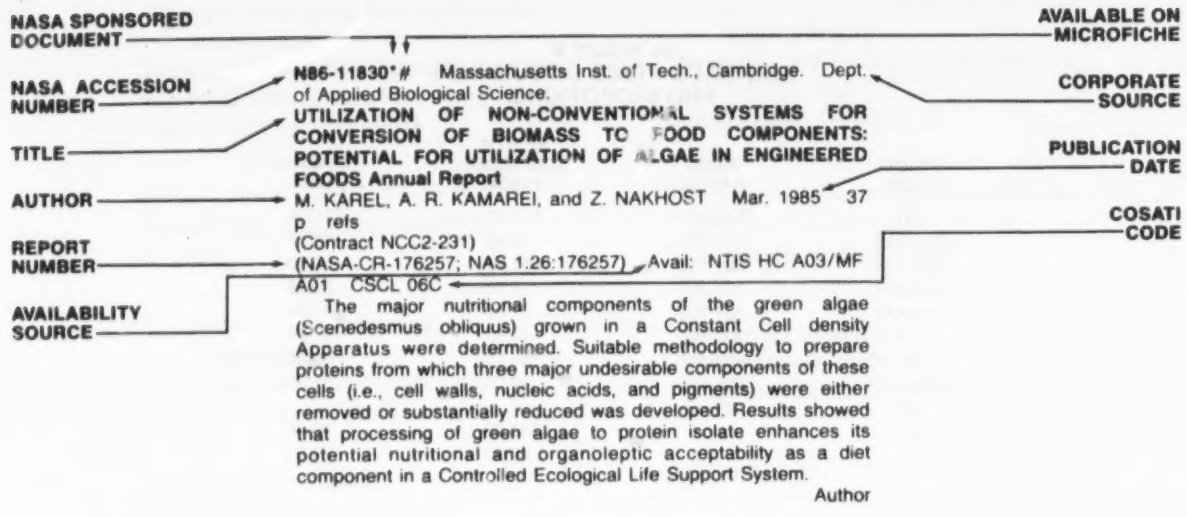

N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.

UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TC FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report

M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs

(Contract NCC2-231)

(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.

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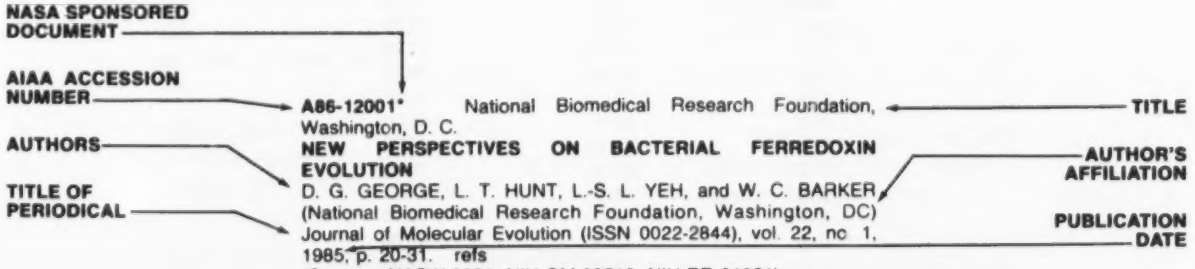

A86-12001* National Biomedical Research Foundation, Washington, D. C.

NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION

D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)

Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs

(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)

Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.

G.R.

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 286)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in June 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 213 reports, articles and other documents announced during June 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA)*. The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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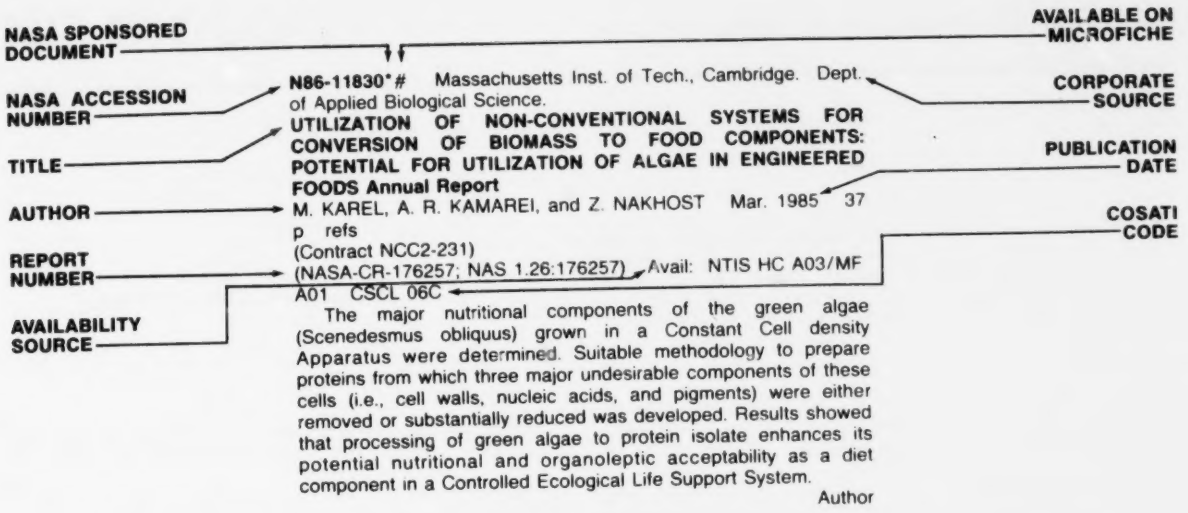
TYPICAL CITATION AND ABSTRACT FROM *STAR*



N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.

UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report

M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs

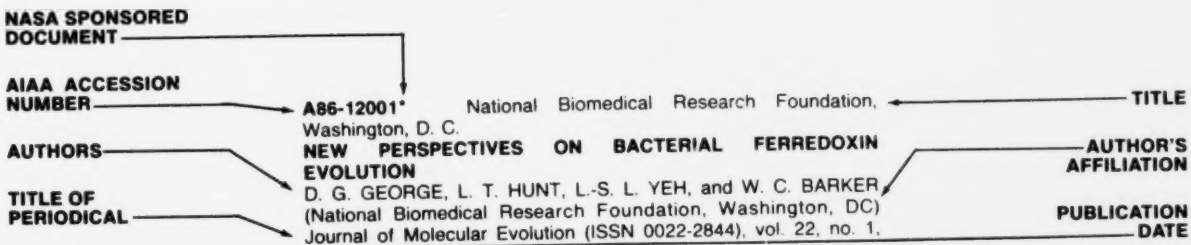
(Contract NCC2-231)

(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C

The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.

Author

TYPICAL CITATION AND ABSTRACT FROM *IAA*



A86-12001* National Biomedical Research Foundation, Washington, D. C.

NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION

D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)

Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1, 1985, p. 20-31. refs

(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)

Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.

G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 286)

JULY 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-26490
STROMATOLITES FROM THE 3,300-3,500-MYR SWAZILAND SUPERGROUP, BARBERTON MOUNTAIN LAND, SOUTH AFRICA
G. R. BYERLY, D. R. LOWER, and M. M. WALSH (Louisiana State University, Baton Rouge) Nature (ISSN 0028-0836), vol. 319, Feb. 6, 1986, p. 489-491. Research supported by the ARCO Foundation, Anglo-American Corp. and University of Cape Town. refs
(Contract NSF EAR-79-19907; NSF EAR-79-19908; NSF EAR-82-06015)

A morphologically variable assemblage of stromatolites has been discovered in thin chert layers within the Fig Tree Group of the Swaziland Supergroup, South Africa. They are commonly low-relief, nearly stratiform, laterally linked domes. Rarer forms include pseudocolumns and crinkly stratiform stromatolites. The stromatolites grew on a substrate of altered komatiitic lava and sediments deposited on the lava surface, and in most places are covered by later komatiitic flows. Abundant fine-grained tourmaline included within the stromatolite laminae suggests that stromatolites formed in an environment dominated by boron-rich hot-spring emissions and evaporitic brines. Author

A86-27051
POLYRIBONUCLEIC ACIDS AS ENZYMES
F. H. WESTHEIMER (California, University, La Jolla) Nature (ISSN 0028-0836), vol. 319, Feb. 13, 1986, p. 534, 535. refs

The implications of the discovery by Cech and Altman (1986) that polyribonucleic acids can function as enzymes are considered. Emphasis is given to a description of the enzymic properties of the cascade of spontaneous selfsplicing reactions in the RNA of Tetrahymena thermopila, in particular the catalytic properties of the intervening linear sequence (1-IVS). The possibility that ribozymes may have preceded protein enzymes in the prebiotic environment is briefly discussed. I.H.

A86-27473
EFFECT OF COSMOHELIOGEOPHYSICAL FACTORS ON BACTERIAL AGGLUTIONATION IN VITRO [VLIIANIE KOSMOGELIOGEOFIZICHESKIKH FAKTOROV NA KHOD AGGLIUTINATSII BAKTERII IN VITRO]
A. M. OPALINSKAIA and L. P. AGULOVA (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) Biofizika (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 94-98. In Russian. refs

The effect of solar cosmic ray characteristics on biological activity was studied, using antiserum-produced agglutination of Salmonella typhosa as an elementary model. The six year long study has encompassed periods of both minimal (1973-1974) and maximal (1977-1980) solar activity. Among the various indices of solar radiation examined, the index of neutron component intensity exhibited the most distinct and reliable correlation with the agglutination rate. Agglutination rate was also seen to vary with season, solar rotation, polarity of the interplanetary magnetic field, and the course of geomagnetic storms. The onset of a geomagnetic storm coincided with a slowdown of the agglutination reaction, while the storm's end coincided with its speedup. Shielding of the reaction vessel with steel and Permalloy has almost abolished these effects, indicating the role of electromagnetism in bioactivity. I.S.

A86-27475
EFFECT OF LOW-POWER MILLIMETER-RANGE MONOCHROMATIC ELECTROMAGNETIC RADIATION ON BIOLOGICAL PROCESSES [VLIIANIE MONOKHROMATICHESKIKH ELEKTROMAGNITNYKH IZLUCHENII MILLIMETROVOGO DIAPAZONA MALOI MOSHCHNOSTI NA BIOLOGICHESKIE PROTSESSY]
M. B. GOLANT Biofizika (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 139-147. In Russian. refs

A systematic analysis is presented of Soviet and foreign studies dealing with the effects of low-power millimeter waves on living organisms. The basic characteristics of the biologically-active microwaves are discussed, including flux density, radiation frequency, duration of exposure, and the maximally sensitive body areas. Special consideration is given to biological and physical factors responsible for the microwave effects, and to biophysical aspects of these effects. The mechanism for the effects of nonionizing monochromatic microwaves is explained by the possibility that the microwave radiation imitates, to a certain extent, the signals of correlation and control used by physiological systems, and thus influences the dynamics of the body's functional changes. I.S.

A86-27878#
MEDICAL TECHNOLOGY IN SPACE - FORESEEABLE ECONOMIC ISSUES
J. S. HIXSON (Medicasters, Inc., Bethesda, MD) IN: Space, our next frontier; Proceedings of the Conference, Dallas, TX, June 7, 8, 1984 . Dallas, TX, National Center for Policy Analysis, 1985, p. 52-61. refs

An evaluation is made of economic factors affecting the development and operation of hospital facilities in space. Such facilities are currently envisioned as serving two distinct primary purposes: the first of these complements the life support systems which will accompany space personnel in exploratory or commercial ventures in space, while the second actively exploits the microgravity environment for the development of novel medical technologies that will be economically useful in either orbital or terrestrial settings. Attention is presently given to the two distinct value and financing systems that these purposes require. O.C.

A86-28124
SKELETAL MUSCLE LACTATE RELEASE AND GLYCOLYTIC INTERMEDIATES DURING HYPERCAPNIA
T. E. GRAHAM, J. K. BARCLAY, and B. A. WILSON (Guelph, University, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Feb. 1986, p. 568-575. refs
(Contract NSERC-A-6466)

The effect of respiratory acidosis on the rates of glycolysis and the lactate (La) release in the autoperfused gastrocnemius-plantaris muscle group was studied in anesthetized dogs ventilated either with air or with oxygen-nitrogen mixture

enriched with 4 percent of CO2. Blood flow, VO2, VCO2, and tension development were unaffected by respiratory acidosis. The glycogen catabolism was also not affected, but the release of La was lowered by muscle activity in CO2, and there was evidence that glycolysis was inhibited at the phosphofructokinase step, with increases recorded for the fructose-6-phosphate, the fructose-6-phosphate/fructose 1, 6-diphosphate, and the alpha-glycerophosphate/dihydroxyacetone phosphate ratios. Net La uptake occurred during the last 10 min of contractions. I.S.

A86-28449
ELECTRICAL ENHANCEMENT OF HEALING
B. A. ROWLEY (Wright State University, Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 994-999. refs

A review is presented of the use of electrical currents in effecting growth and regeneration of soft tissue, with a particular focus on low intensity direct currents. Data are presented on the use of tissue cultures as a model for investigating the phenomena. The use of low-intensity direct currents has been shown to enhance the repair of decubitus ulcers and to assist in the elimination of infecting bacteria. The exact mechanisms of this process are not known. Studies in vivo and in vitro do not always correlate. Low level 60-Hz currents have not been shown to have any measurable effect on bacteria or tissue growth. D.H.

A86-28793
CRITICAL LIFE SCIENCE ISSUES FOR A MARS BASE
P. J. BOSTON (National Center for Atmospheric Research, Boulder, CO) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 287-332. refs
(AAS 84-167)

A number of the major issues of concern to the life scientist in regard to future Mars missions are examined. Issues covered include: contamination (forward and backward between Mars and earth), self-sufficiency of the base (whether the needs of the crew are to be totally resupplied, partially resupplied, or met through primary self-sufficiency), food self-sufficiency (including an adequate buffer or reserve for nutrition, and considering, as one possibility, microorganisms for food). Research recommendations, medical issues, and the question of whether life now exists or has ever existed on Mars are additional issues to be weighed. D.H.

A86-28860* Miami Univ., Fla.
CHARACTERIZATION AND OPTIMIZATION OF HYDROGEN PRODUCTION BY A SALT WATER BLUE-GREEN ALGA OSCILLATORIA SP. MIAMI BG 7. II USE OF IMMOBILIZATION FOR ENHANCEMENT OF HYDROGEN PRODUCTION
E. J. PHLIPS and A. MITSUI (Miami, University, FL) International Journal of Hydrogen Energy (ISSN 0360-3199), vol. 11, no. 2, 1986, p. 83-89. refs
(Contract NSF CPE-83-12092; NAS10-10531)

The technique of cellular immobilization was applied to the process of hydrogen photoproduction of nonheterocystous, filamentous marine blue-green alga, Oscillatoria sp. Miami BG 7. Immobilization with agar significantly improved the rate and longevity of hydrogen production, compared to free cell suspensions. Rates of H2 production in excess of 13 microliters H2 mg dry/wt h were observed and hydrogen production was sustained for three weeks. Immobilization also provided some stabilization to environmental variability and was adaptable to outdoor light conditions. In general, immobilization provides significant advantages for the production and maintenance of hydrogen photoproduction for this strain. Author

A86-29089* National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.
FOLIAGE PLANTS FOR INDOOR REMOVAL OF THE PRIMARY COMBUSTION GASES CARBON MONOXIDE AND NITROGEN DIOXIDE
B. C. WOLVERTON, R. C. MCDONALD (NASA, National Space Technology Laboratories, Bay St. Louis, MS), and H. H. MESICK (Pan American World Services, Bay St. Louis, MS) Mississippi Academy of Sciences, Journal (ISSN 0076-9436), vol. 30, 1985, p. 1-8. refs

Foliage plants were evaluated for their ability to sorb carbon monoxide and nitrogen dioxide, the two primary gases produced during the combustion of fossil fuels and tobacco. The spider plant (Chlorophytum elatum var. vittatum) could sorb 2.86 micrograms CO/sq cm leaf surface in a 6 h photoperiod. The golden pothos (Scindapsus aureus) sorbed 0.98 micrograms CO/sq cm leaf surface in the same time period. In a system with the spider plant, greater than or equal to 99 percent of an initial concentration of 47 ppm NO2 could be removed in 6 h from a void volume of approximately 0.35 cu m. One spider plant potted in a 3.8 liter container can sorb 3300 micrograms CO and effect the removal of 8500 micrograms NO2/hour, recognizing the fact that a significant fraction of NO2 at high concentrations will be lost by surface sorption, dissolving in moisture, etc. Author

A86-29096
STIMULATION OF BRAIN MUSCARINIC ACETYLCHOLINE RECEPTORS ACUTELY REVERSES RADIOGENIC HYPODIPSIA
G. A. MICKLEY (U.S. Armed Forces Radiobiology Research Institute, Bethesda, MD) and K. E. STEVENS (U.S. Air Force Academy, Colorado Springs, CO) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 250-255. DOD-USAF-supported research. refs

The role of hypothalamic muscarinic receptors in the production of radiation-induced hypodipsia was investigated in Co-60-irradiated rats, by measuring water consumption changes after intrahypothalamic injection of either carbachol (a muscarinic agonist) or atropine (an antagonist) into the irradiated rats. The lower dose of radiation (600 rads) produced a 5-d hypodipsia, whereas a more transient, albeit larger, effect was seen after 1000 rads. Carbachol produced acute reversal of radiogenic hypodipsia, while atropine potentiated the hypodipsia. These postirradiation drug-induced behaviors were similar to those observed after the same dose was given before irradiation. The persistence and the pharmacologic liability of the cholinergic functions suggest that other neuronal systems and/or neurochemicals may be more prominently involved in the radiogenic hypodipsia. I.S.

A86-29097
CHANGES IN GLYCOLYTIC INTERMEDIATES IN RAT ERYTHROCYTES DURING EXPOSURE TO SIMULATED HIGH ALTITUDE
A. NAKAMURA, H. OSADA, T. SAKAGUCHI, I. SAKURAI, and S. YAGURA (Japan Air Self-Defense Force, Aeromedical Laboratory, Tokyo) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 256-262. refs

Regulatory mechanisms of erythrocyte glycolysis and 2,3-diphosphoglycerate (2.3DPG) metabolism under hypoxia were studied in rats exposed to a simulated altitude of 18,000 ft (5,486 m) for 5 d. Changes in erythrocyte glycolytic intermediates were determined by enzymatic analysis. Marked alterations of glycolytic intermediates were found during 1 d of exposure which were quite different from those observed during exposure for 2,3, and 5 d. Alterations of intermediates seem to be highly correlated with blood pH changes; however, pH alone cannot explain the overall changes in intermediates. Results suggested that overall intermediate changes are the results of the combined effect of alterations of cellular pH and hemoglobin desaturation. Increased 2,3DPG at initial stages of exposure (within 1 d) may be caused mainly by the increased cellular pH; sustained elevation of 2,3DPG at later

stages could be attributed to the relief of product inhibition of diphosphoglycerate mutase by deoxygenation. Author

A86-29099
CARDIOVASCULAR RECEPTORS AND FLUID VOLUME CONTROL (1985 ARMSTRONG LECTURE)
J. P. MEEHAN (Southern California, University, Los Angeles, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 267-275. refs

Experiments with negative pressure breathing led Gauer and Henry to the discovery of left atrial receptors that affected the release of ADH and the concept of a cardiovascular basis for fluid volume control. Since then, neural mechanisms involving cardiac receptors controlling the release of renin have been described, thus giving strong support for the role of cardiac receptors in fluid volume control. The original experimental work in the dog has been confirmed. The available pool of patients that have undergone heart transplant operations provide the opportunity for more definitive studies on the role of cardiac receptors in the control of cardiovascular function. Author

A86-29174
EFFECT OF WEIGHTLESSNESS ON THE DEVELOPMENT OF NEUROSECRETORY STRUCTURES OF THE HYPOTHALAMO-HYPOPHYSEAL SYSTEM OF THE RAT BRAIN (ELECTRON-MICROSCOPE STUDY) [VLIIANIE NEVESOMOSTI NA RAZVITIE NEIROSEKRETORNYKH STRUKTUR GIPOTALAMO-GIPOFIZARNOI SISTEMY MOZGA KRYS /ELEKTRONNO-MIKROSKOPICHESKOE ISSLEDOVANIE/]
I. I. BABICHENKO (Universitet Druzhby Narodov, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 286, no. 4, 1986, p. 976-978. In Russian. refs

The paper presents an analysis of the ultrastructure of the neurosecretory elements of the hypothalamo-hypophyseal system of developing rats whose mothers were flown on the Cosmos-1514 biosatellite during the 13-18th days of pregnancy. A delay in differentiation and changes in the basic components of the neuropil were observed in the neurosecretory-element ultrastructure in 18-day rat embryos 5-6 hours after a 5-day stay in weightlessness. These changes are evidently connected with the effect of a number of humoral factors (particularly an elevated concentration of calcium ions in the blood) on the developing brain. B.J.

A86-29255
ELECTRICAL ACTIVITY OF CEREBELLUM IN THE WAKEFULNESS-SLEEP CYCLE [ELEKTRICHESKAIA AKTIVNOST' MOZZHECHKA V TSIKLE BODRSTVOVANIE-SON]
G. L. BEKAIA and G. G. BERADZE (AN GSSR, Institut Fiziologii, Tbilisi, Georgian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1480-1487. In Russian. refs

Dynamics of spontaneous electrical activity of cerebellar cortex and of fastigial nuclei were compared in unrestrained cats with implanted electrodes. The activity recorded during the periods of wakefulness and various phases of sleep revealed characteristic differences between these two structures, expressed most clearly during the paradoxical sleep phsae. An analysis of activities in fastigial nuclei and dorsal hippocampus has shown a weak correlation between the two processes. Functional significance of the changes observed in electrical activity of the cerebellum during the wakefulness-sleep cycle and their possible mechanisms are discussed. I.S.

A86-29256
CALMODULIN, A SECOND MESSENGER - HISTORY OF INVESTIGATION AND PHYSIOLOGICAL IMPORTANCE [KAL'MODULIN-VTORICHNYI PERADTCHIK /SECOND MESSENGER/ ISTORIIA IZUCHENIIA, FIZIOLOGICHESKOE ZNACHENIE]
P. K. KLIMOV and B. V. MISSIUL (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1500-1512. In Russian. refs

The primary structure of calmodulin, its physicochemical properties, and molecular conformation are presented, together with a discussion of calmodulin distribution in body tissues and in subcellular structures. Consideration is given to changes in cellular calmodulin contents due to physiological changes and pathological alterations. Special attention is given to the enzymatic targets of calmodulin and to the mechanism of its action. The role of calmodulin in the hormonal effects of catecholamines, dopamine, insulin, the renin-angiotensin system, and other hormones is discussed. I.S.

A86-29257
MECHANISMS OF CALCIUM PERMEABILITY CHANGES IN THE SARCOLEMMA OF VASCULAR SMOOTH-MUSCLE CELLS DURING HYPOXIA [MEKHANIZMY IZMENENIIA KAL'TSIEVOI PRONITSAEMOSTI SARKOLEMMY GLAKOMYSHECHNYKH KLETOK SOSUDOV PRI GIPOKSII]
A. I. SOLOVEV and A. V. STEFANOV (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 71, Dec. 1985, p. 1560-1567. In Russian. refs

A86-29275
THE INFLUENCE OF THE INITIAL VALUE OF A PARAMETER ON ITS CHANGE UNDER THE ACTION OF EXTERNAL FACTORS [VLIIANIE ISKHODNOI VELICHINY PARAMETRA NA EGO IZMENENIIA PRI VNESHNIKH VOZDEISTVIIAKH]
V. I. KOPANEV and V. V. VLASOV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Akademiia Nauk SSSR, Izvestiia, Seriia Biologicheskaia (ISSN 0002-3329), Jan.-Feb. 1986, p. 96-114. In Russian. refs

The chief postulates and consequences of the law of initial values (LIV), concerning changes in organisms under the action of external factors, are discussed. The applicability of the LIV in the analysis of the responsivity and resistance of organisms is shown to be very broad. The LIV can explain many individual differences between organisms and the characteristics of the initial state of organisms at the moment external stimulation is applied. The relationship between the LIV and other ways of describing responses of the organism to external factors are examined. B.J.

N86-20444# Joint Publications Research Service, Arlington, Va.
SHKLOVSKIY DISCUSSES POSSIBILITY OF EXTRATERRESTRIAL INTELLIGENCE
I. S. SHKLOVSKIY *In its* USSR Report: Space (JPRS-USP-86-002) p 39-44 10 Feb. 1986 Transl. into ENGLISH from Zemlya I Vselennaya (Moscow, USSR), no. 3, May - Jun. 1985 p 76-80
Avail: NTIS HC A05

The silence of the universe can be completely and naturally attributed to the fact that extraterrestrial civilizations have either perished, not being able to contend with the problems that arose in the course of their own development, or there have never been such civilizations. In an examination of the history of terrestrial civilization it is seen that there are global problems in the present era and an inability to solve them can lead mankind to destruction. The proposed hypothesis makes possible a more profound discussion of the board range of problems related to the future of mankind and the extent to which life occurs in the universe. Author

N86-20445# Joint Publications Research Service, Arlington, Va.
SALYUT-7 ELECTROPHORESIS EXPERIMENTS AID MEDICAL RESEARCH
T. CHESANOVA *In its* USSR Report: Space (JPRS-USP-86-002) p 45 10 Feb. 1986 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2
Avail: NTIS HC A05

Experiments performed by crews of Salyut orbiting stations have been aimed at obtaining extrapure hemagglutinin and other surface proteins of the influenza virus, using the method of electrophoresis. The series of space experiments called Tavriya demonstrated that such products can be obtained comparatively quickly and easily in conditions of zero gravity. A new generation electrophoretic unit called EFU-Robot is now in use on the Salyut-7 station. The EFU-Robot can be programmed by a cosmonaut to select samples of substances purified in the course of experiments and automatically transfer the samples from the unit's working chamber to ampoules, using syringes. Preparations obtained during the current manned orbital mission were delivered to Earth recently by cosmonauts. Author

N86-20690# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY INSTITUTE Abstract Only
Y. KRUSHELNITSKIY *In its* USSR Report: Earth Sciences (JPRS-UES-86-001) p 5-6 10 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3
Avail: NTIS HC A04

Natural mechanisms of anticipation of weather changes in animals and human beings, and effects of weather conditions on human behavior and working fitness were studied. Meteorological sounds on the noise of free atmosphere caused by turbulent motion of the air. It is perceived by living organisms as sounds, analyzed by them and their behavior is modified accordingly. The biological forecasting mechanism may lead to the development of improved weather-forecasting methods and equipment. An acoustic weather-forecasting method was ued. Cloudiness and precipitation reportedly were forecast with accuracies of 98% and 85 percent using this method. A medical forecasting method using primary data, which is based on the meteorological-adaptation hypothesis was developed. Ecological factors are considered in the forecasting and prevention of illness. E.A.K.

N86-21097*# National Aeronautics and Space Administration, Washington, D.C.
THE HUMAN FACTOR: BIOMEDICINE IN THE MANNED SPACE PROGRAM TO 1980
J. A. PITTS 1985 402 p refs *In its* History Series
(Contract NASW-3213)
(NASA-SP-4213; NAS 1.21:4213; LC-85-21526) Avail: SOD HC $23.00 as 033-000-00977-1; NTIS MF A01 CSCL 05E

The purpose of this publication is to provide NASA personnel, NASA managers, and the biomedical and historical research communities a well-documented, historical summary of the content and organization of NASA's biomedical programs from Project Mercury up to the Shuttle program. The publication includes not only a major narrative portion, but appendixes and reference notes. Author

N86-21098# Michigan Univ., Ann Arbor. Dept. of Physiology.
CIRCADIAN VARIATION IN HOST DEFENSE Annual Report, Nov. 1984 - Oct. 1985
M. J. KLUGER 18 Nov. 1985 10 p
(Contract N00014-85-K-0027; RR0-4108)
(AD-A161702) Avail: NTIS HC A02/MF A01 CSCL 06O

We have been monitoring the body temperature and relative activity of up to 24 rats at a time using a recently developed biotelemetry system (The Dataquest III; Mini-Mitter Company). Each cage is maintained in a constant temperature chamber at 27 C and is on a 12:12 hour light-dark cycle. In the process of testing the versatility of this system and obtaining pilot data we have generated data for two manuscripts: (1) Hyperthermia induced by open-field stress is blocked by salicylate, Physiology and Behavior, and (2) Selection of cage size by Sprague-Dawley rats. Data directly relevant to the ultimate goal of the research include the following: a. We have established a dose of sodium salicylate which will block the circadian rise in body temperature, and b. We have established the normal circadian variation in activity for rats maintained on a 12:12 light-dark cycle. The administration of an antipyretic dose of sodium salicylate to rats in the late afternoon resulted in significant attenuation of the rise in body temperature normally observed at night; the drug had no effect on activity. Administration of this same dose of sodium salicylate to rats during the morning hours had no effect on body temperature or on activity. Since antipyretic drugs are thought to act by returning an elevated thermoregulatory set-point to normal, these data suggest to us that the rise in temperature observed at night in rats is a true fever, perhaps induced by interleukin-1 (IL-1). GRA

N86-21099# Georgia Univ., Athens.
ROLE OF CA(2+)/CALMODULIN IN PHOSPHORYLATION OF PROTEINS IN PLANTS Final Report, 1 Aug. 1983 - 31 Jul. 1985
M. J. CORMIER 1985 11 p refs
(Contract DE-AS09-83ER-13107)
(DE86-001804; DOE/ER-13107/3) Avail: NTIS HC A02/MF A01

In order to elucidate the role of Ca(2+)-dependent protein phosphorylation in plant cell function, a Ca(2+)-dependent protein kinase from suspension-cultured soybean cells has been partially purified and characterized. It was previously shown that crude extracts of the soybean cells contain soluble protein kinase(s) that preferentially phosphorylates at least eight endogenous proteins in vitro in the presence of 0.5 mM CaCl2. An assay based on phosphorylation of the artificial substrate histone H1 has been devised. DOE

N86-21100# Los Alamos National Lab., N. Mex.
NEW ROLES FOR COMPUTATION IN THE LIFE SCIENCES
G. I. BELL 1985 13 p refs Presented at the Computer Analysis for Life Science, Okayama, Japan, 9 Jul. 1985
(Contract W-7405-ENG-36)
(DE85-017542; LA-UR-85-2985; CONF-850784-2) Avail: NTIS HC A02/MF A01

Important new roles for computation in the life sciences are being found in the study of the linear polymers DNA, RNA, and proteins, and in the correlation of the sequence with the structure and function of each. Because of the ease with which DNA sequences can be determined and the definitive and often surprising information contained in the sequences, an explosion of biological information is taking place that will increasingly rely on computers for its analysis and understanding. DOE

N86-21101# Brookhaven National Lab., Upton, N. Y.
EXPERIMENTAL, STRUCTURAL AND THEORETICAL MODELS OF BACTERIOCHLOROPHYLLS A, D AND G
J. FAJER, K. M. BARKIGIA, E. FUJITA, D. A. GOFF, L. K. HANSON, J. D. HEAD, T. HORNING, K. M. SMITH, and M. C. ZERNER 1985 17 p refs Prepared in cooperation with California Univ., Davis, and Florida Univ., Gainesville
(Contract DE-AC02-76CH-00016)
(DE86-001727; BNL-36992) Avail: NTIS HC A02/MF A01

The model studies presented here probe possible effects that the protein environment may induce or impose on the conformation and electronic configuration of photosynthetic chromophores. Results are presented for the effect of axial ligation and hydrogen bonding on the electron spin resonance properties of bacteriopheophytin and bacteriochlorophyll a cation radicals. X-ray diffraction results on single crystals illustrate the significant conformational changes that different crystal habits enforce on the same skeleton of bacteriopheophytins d and the structural consequences of oxidation on a magnesium porphyrin. Theoretical calculations are also described that predict spectral and redox properties of bacteriochlorophyll g, the recently discovered chromophore of the anoxygenic bacterium, heliobacterium chlorum. DOE

N86-21102# Pacific Northwest Lab., Richland, Wash.
COMPARATIVE ANALYSIS OF BIOMASS PYROLYSIS CONDENSATES
D. C. ELLIOTT Sep. 1985 38 p refs Presented at the Health and Environmental Research on Complex Organic Mixtures, Richland, Wash., 21 Oct. 1985
(Contract DE-AC06-76RL-01830)
(DE86-001773; PNL-SA-13158; CONF-851027-2) Avail: NTIS HC A03/MF A01

The purpose of this research is to determine the chemical composition, physical properties, and biological activity of biomass gasification/pyrolysis tars and condensates. The analytical results show conclusively that all biomass derived tars and condensates are not the same. There is no typical tar composition that can be adequately used. It is dependent on the operating conditions, principally a time/temperature thermal severity-type function. Results show high biological activity (Ames assay) only in high-temperature processed tars. Mutagenic activity in gasification condensates is correlated with the concentration of polycyclic aromatic hydrocarbons in the same. Based on the above information, a potential processing dilemma has now been identified. Higher temperatures are generally perceived to improve the efficiency and rate of gasification. In addition, our data also suggests that less contamination will remain in the aqueous byproduct stream when the gasification is performed at higher temperature. On the other hand, the tar components that do remain following higher temperature processing contain more highly condensed PAH which result in a higher level of mutagenic activity. The transformation from phenolic to PAH is strongly a function of temperature in the range of 700(0) to 950(0)C. Therefore consideration of the processing requirements for the aqueous condensate stream versus the organic condensate stream may become critical with operating temperature being the major independent variable. DOE

N86-21132# Joint Publications Research Service, Arlington, Va.
GREENHOUSES WITH CURVILINEAR PLANTING SURFACE
Y. A. BERKOVICH, V. A. KORBUT, and V. I. PAVLOVSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 115-119 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 77-80
Avail: NTIS HC A08/MF A01

The laws of light distribution in plants shown on the flat plane, spherical or cylindrical surfaces were investigated. In microgravity where the plants are arranged radially the level of illumination of lower leaf strata is higher on curvilinear than on flat surfaces. This is due to the following: as the plants grow they get separated; also, the concentration of the light flux increases with depth of plants on the curvilinear surfaces. In view of this, a space greenhouse is suggested, the design of which provides high productivity per unit volume and per unit energy of the incident flux of photosynthetically active radiation. Author

N86-22082# Gordon Research Conferences, Inc., Kingston, R.I.
PROCEEDINGS: PROTONS AND MEMBRANE REACTIONS HELD AT SANTA BARBARA, CALIFORNIA ON 28 JANUARY - 1 FEBRUARY 1985
L. PACKER and D. DEAMER 9 Oct. 1985 28 p Conference held in Santa Barbara, Calif., 28 Jan. - 1 Feb. 1985
(Contract N00014-85-G-0055; DA PROJ. RR0-4108)
(AD-A161331) Avail: NTIS HC A03/MF A01 CSCL 06A

The Proceedings of the Confeence on Protons and Membrane Reactions which took place at Santa Barbara, California, on 28 January to 1 February, 1985, included the following topics: Intracellular Water Structure/Translocation; Concepts and Principles of Membrane Proton Conduction Pathways; Translocation of Protons/Water through Lipsomes and Model Systems; Non Bulk Phase vs Bulk Proton Translocation; Translocation of Protons Through Membranes: Bacteriorhodopsin; Transmembrane Proton Translocation by the F sub 0 Moiety of H(+)-ATP (Adenosine Triphosphate) Synthase; Proton Translocation and the Catalytic Process in the H+-ATP Synthase; The Flagellar Motor System; Proton Translocation Through Redox Complexes. GRA

N86-22083# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THEORETICAL PREREQUISITES FOR THE POSSIBLE USE OF BACTERIA WHICH SPLIT ORGANOPHOSPHATES IN ORDER TO INCREASE THE YIELD OF NUTRIENT YEAST AND ITS NITROGEN AND PHOSPHOROUS CONTENT
D. L. SHAMIS 28 Oct. 1985 25 p Transl. into ENGLISH from Trudy Instituta Mikrobiologii i Virusologii, Adademiya Nauk Kazakhskoy SSSR (USSR), v. 11, 1968 p 3-17
(AD-A161811; FTD-ID(RS)T-1393-84) Avail: NTIS HC A02/MF A01 CSCL 06M

This article reflects the theme of one of the areas of investigation of the Laboratory of Microbial Protein Synthesis, where we are studying the factors which accelerate the conversion (mobility) of macroergic and other phosphorous compounds. The purpose of these studies is to increase the energy supply of the metabolic synthesis reactions connected with the yield and quality of food yeast. Professor Malkov, the author of the idea of the partial inhibition of respiration in order to save carbon, mentions a factor which may be the cause of intensification of the biosynthetic processes of the yeasts he investigated. We are speaking here about the doubled amount of labile phosphorous p7 obtained in yeast as a result of placing it in concentrated orthophosphate. In our investigations the increased labile phosphorous content is connected with the biosynthetic activity of the yeast. The article correlates many stuides which show the very important role of ATP and polyphosphates as energy accumulators and transporters, and presents data from the literature and preliminary results of our own investigations which indicate the exceptional effectiveness of making practical use of the phenomena of microbial synergism and metabiosis. Bacteria which split orthophosphates were studied on the basis of these results. There is also significant interest in the phosphatase activity of food yeast using organophosphates as a phosphorous source. GRA

N86-22084# Minnesota Univ., Duluth. Dept. of Medical Microbiology and Immunology.
SUPPRESSION OF ANTIBODY FORMING CELLS BY MURAMYL DI-PEPTIDES Final Report, Aug. 1982 - Nov. 1985
M. WAKAI and A. G. JOHNSON 1 Dec. 1985 25 p
(Contract N00014-82-K-0635; RR0-4108)
(AD-A162400) Avail: NTIS HC A02/MF A01 CSCL 06E

Non-toxic synthetic adjuvants are under prime consideration for use in increasing the immune response of human beings. Three of microbial origin are the muramyl di-peptides (N-acetyl-muramyl-L-alany-D-isoglutamine and analogs, termed MDP), polyadenylic acid polyuridylic acid-polyuridylic acid complexes termed poly A-poly U) and the recently isolated monophosphoryl lipid A. While each of these has been demonstrated in animals to be active in increasing the immune response when given with the antigen, each also has been found to suppress this response when given one to several days before antigen. The enhancing actions of MDP and poly A-poly U have been well characterized. However, characterization of the suppressive phenomenon has been minimal, but it is important to gain a responsible understanding of how these adjuvants regulate the immune response non-specifically. Accordingly, the experiments proposed during the tenure of this contract were undertaken to further knowledge of how each of these adjuvants activate the suppressive arm of the immune response. GRA

N86-22085# Minnesota Univ., Duluth. Dept. of Medical Microbiology and Immunology.
STUDIES ON THE MECHANISM OF SUPPRESSION OF THE IMMUNE RESPONSE BY SYNTHETIC, NON-TOXIC ADJUVANTS Final Report, Aug. 1982 - Nov. 1985
A. G. JOHNSON, M. J. ODEAN, M. WAKAI, and M. TOMAI 1 Dec. 1985 26 p
(Contract N00014-82-K-0635; RR0-4108)
(AD-A162444) Avail: NTIS HC A03/MF A01 CSCL 06E

The immunomodulatory action of a non-toxic monophosphoryl lipid A (MPL) and a toxic diphosphoryl lipid A (DPL) fraction derived from endotoxins of the heptoseless mutants of bacteria were compared. Both derivatives retained the ability characteristic of lipopolysaccharides, to enhance antibody formation in young adult mice when injected along with antigen and suppress antibody production when given a day before antigen. In aging mice, a model of immunodeficiency, a marked restoration of antibody formation was observed when antigen was injected together with either MPL or DPL. Levels of antibody in these aging mice were comparable to those observed in young adult mice. Moreover, both MPl and DPL enhanced antibody production significantly in the endotoxin low-responder mouse strains, C3H/HeJ and C57Bl/10 ScN, whereas, phenol-water extracted endotoxin from an R-7 mutant was ineffective. MPL and DPL also acted as suppressive agents when administered prior to antigen in the C3H/HeJ strain. Thus, the results from these studies show that (a) the toxic properties of lipid A can be removed without eliminating immunomodulating activity, and (b) such lipidic compounds can overcome the immunologic lesions of immunodeficient and hyporesponsive animals. GRA

N86-22086# California Univ., Berkeley. Dept. of Microbiology and Immunology.
MOLECULAR AND BIOLOGICAL PROPERTIES OF AN IMMUNOPOTENTIATING COMPLEX POLYSACCHARIDE ADJUVANT PRODUCED BY A GLIDING BACTERIUM Annual Report, 1 Jul. 1984 - 30 Jun. 1985
R. I. MISHELL and W. R. USINGER 13 Dec. 1985 15 p
(Contract N00014-84-K-0626)
(AD-A162664) Avail: NTIS HC A02/MF A01 CSCL 06O

Gliding bacteria adjuvant (GBA) is composed of macromolecular substances secreted or shed into the growth media of a newly described Cytophaga species. We had established prior to the onset of this contract that GBA strongly augments the in vitro generation of humoral immunity by mouse spleen cells and that it is mitogenic for murine spleen cells. Since GBA is very water soluble, its absorbance at 280 nm is low, and its biological activities are stable to boiling, we hypothesized that GBA was a polysaccharide or a complex of polysaccharides. Our principal objectives during the first year of this contract were to develop methods for large scale production and purification of GBA, to initiate studies of its physical and chemical properties, to prepare a panel of monoclonal antibodies against GBA for future studies defining its biologically significant epitopes and to extend studies of its biological activities. Large scale production and purification have been essentially achieved using protocols described in this report. Knowledge of the biological activities of GBA for mammalian cells was extended this year. Titration curves with the most highly purified preparations of GBA were performed with assays measuring in vitro adjuvanticity, mitogenicity, B cell polyclonal activation and induction of the murine macrophage cell line, WEHI 265, to secrete IL-1. Studies on the mechanism of action of GBA were initiated. GRA

N86-22087# Northeastern Univ., Boston, Mass. Dept. of Biology.
LYMPHOCYTE ACTIVATION - REGULATORY SUBSTANCES Final Report, Jun. 1982 - Sep. 1985
P. R. STRAUSS 10 Dec. 1985 8 p
(Contract N00014-82-C-0283)
(AD-A162683) Avail: NTIS HC A02/MF A01 CSCL 06P

Initially, the objectives of this work were to characterize substances which regulated DNA synthesis in lymphocytes. In particular we wished to determine the role of detergent soluble (DS)DNA in replication of activated splenocytes. We now feel that DS DNA is a hitherto overlooked class of replication intermediates not yet stabilized by nucleosome maturation. One possibility is that the detergent lability arises because of the presence of topoisomerase II in the replicating region which results in the release of these fragile fragments. These observations hold not only in activated lymphocytes but also in any actively dividing cell. GRA

N86-22088# Tel-Aviv Univ. (Israel). Dept. of Chemistry.
BIMANE DERIVATIVES AS FLUORESCENT PROBES FOR BIOLOGICAL MACROMOLECULES Periodic Report, No. 4, Jul. - Dec. 1985
E. M. KOSOWER Dec. 1985 16 p
(Contract DAJA45-83-C-0057)
(AD-A162725) Avail: NTIS HC A02/MF A01 CSCL 07C

Nine years ago, a convenient syntheses for a new class of heterocyclic molecules, the bimanes or 1,5-diazabicyclo(3.3.0) octadienediones was discovered and developed. In the course of preparing the bromo derivatives, fortuitously that proteins were fluorescently labeled by bromobimanes. It was established that bromobimanes reacted preferentially with thiols, and usefulness of such labeling for both small and large molecules in biological systems was demonstrated. Many applications of the agents have been reported. The primary aims of our research on the bimanes are divided into the following areas: (1) synthesis, (2) reactivity, (3) photophysics, and (4) application to macromolecules. Although we have a number of new results, it seems pertinent to base this report on a new summary of the application of bimane labeling to thiols. GRA

N86-22089# Ohio State Univ., Columbus. Dept. of Microbiology.
DEVELOPMENT AND USE OF ANUCLEATED BACTERIAL CELLS TO ASSAY THE IN VIVO ACTIVITY OF POLLUTANTS Final Report, Apr. 1981 - Jul. 1985
J. N. REEVE and J. B. RICE 31 Jul. 1985 93 p
(Contract AF-AFOSR-0087-81)
(AD-A162727; AFOSR-85-1136TR) Avail: NTIS HC A05/MF A01 CSCL 06M

There were 2 objectives in this research project: development of an in vivo assay for mistranslation-inducing activity of pollutants and characterization of amino acid substitutions. The first objective proved to be the more difficult. The T7 0.3 gene product (0.3 protein) was purified by a modification of the published procedure, and used to raise rabbit antibody to this protein. A radioimmune precipitation assay was developed which coulu be used to estimate increased misincorporation of cysteine into 0.3 protein. A sample assay involving only counting of the radioimmune precipitate was not achieved because we were not able to obtain the 0.3 protein free of contaminating proteins in the RIP. The 2nd objective proved more fruitful. The cysteine substitution sites in the N-terminal 42 positions of 0.3 protein have been successfully identified. Cleavage of 0.3 protein with trypsion to identify cysteine for arginine substitutions showed that the major sites of cysteine misincorporation were at residues other than arginine. Sequencing of (35S) cysteine-labeled 0.3 protein showed that the most frequent substitution was at residue 15 (tyrosine) and other substitutions were at a positions 9 (asparagine), 12 (aspartate), 41 (alanine) and 42 (aspartqate). GRA

N86-22090# Charles F. Kettering Research Lab., Yellow Springs, Ohio.
PARTICULATE MODELS OF PHOTOSYNTHESIS Progress Report
G. R. SEELY Oct. 1985 27 p refs
(Contract DE-FG02-84ER-13187)
(DE86-001625; DOE/ER-13187/2) Avail: NTIS HC A03/MF A01

Studies are reported on the photochemical and physical properties of chlorophyll while associated with various surfactants onto polyethylene particles. Results to date have shown that the

forms of chlorophyll association are specific to the surfactant; furthermore, when chlorophyll is ligated by the surfactant, even dense associations are fluorescent, but when the ligating surfactant contains a reducible group like quinone, the fluorescence is strongly suppressed. DOE

N86-22091# Oak Ridge National Lab., Tenn.
BIOMEDICAL AND ENVIRONMENTAL SCIENCES AT OAK RIDGE NATIONAL LABORATORY
1985 47 p
(Contract DE-AC05-84OR-21400)
(DE86-001639; ORNL/M-88) Avail: NTIS HC A03/MF A01

The themes, activities, and facilities of the Biomedical and Environmental Sciences Program at Oak Ridge National Laboratory are described. Programs discussed include those in the Biology Division, Environmental Sciences Division, Health and Safety Research, and the Biotechnology Program. DOE

N86-22092# Science Applications International Corp., La Jolla, Calif.
JAPANESE TECHNOLOGY EVALUATION PROGRAM (JTECH): BIOTECHNOLOGY PANEL Final Report
D. OXENDER, C. COONEY, D. JACKSON, G. SATO, and R. WICKNER Jun. 1985 171 p Sponsored in part by Department of Commerce, Washington, D.C.
(Contract TA-83-SAC-02254; NSF PRA-85-13755)
(PB86-109386; JTECH-TAR-8404; NSF/PRA-85016) Avail: NTIS HC A08/MF A01 CSCL 06E

Japanese research and development in several of the main areas of biotechnology, including biochemical process technology, biosensors, cell culture technology, protein engineering, and recombinant DNA technology are assessed. Japan's strategic planning in biotechnology is based on a 10 to 15 year time scale, whereas most similar planning and resource commitment in the United States is based on a 3 to 5 year time scale. This difference in time scale is thought to be partially responsible for Japan's apparently more technology-driven than market-driven resource commitment. It is noted that much of the commercialization of biotechnology in Japan is being carried out by large established companies and that Japan has a well-established coordination of the development of biotechnology by industry, universities, and government groups. GRA

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-27474
INTERACTION BETWEEN THE OTOLITHIC ORGAN AND THE SEMICIRCULAR CANALS OF THE VESTIBULAR APPARATUS IN THE SYSTEM OF SPATIAL ANGULAR STABILIZATION IN HUMANS [VZAIMODEISTVIE OTOLITOVOGO ORGANA I POLUKRUZHNYKH KANALOV VESTIBULIARNOGO APPARATA V SISTEME UGLOVOI STABILIZATSII CHELOVEKA V PROSTRANSTVE]
V. M. GUSEV (AN SSSR, Institut Fiziologii, Leningrad, USSR) and V. A. KISLIAKOV Biofizika (ISSN 0006-3029), vol. 31, Jan.-Feb. 1986, p. 123-127. In Russian. refs

A mathematical model is developed for spatial angular stabilization in which the fixed and variable space coordinates are related to the coordinates of the semicircular canals and the otolithic organ during spatial displacement. The equations describing the interrelationship of both vestibular systems are solved for the case of abrupt displacement of angular vectors, and for the case of slow periodic variations of the same angles, approximating the pitching and rocking motions of a medium-size fishing trawler. The results indicate a need for integrated activity of both the semicircular canals and the otolithic organ for an acceptable stabilization: the canals insure short-term stabilization and stabilization during the abrupt changes of spatial orientation, while the otolithic organ plays a dominant role during long-term slowly occurring changes. I.S.

A86-28098#
THE EFFECTS OF CIRCUIT WEIGHT TRAINING AND G EXPERIENCE ON +GZ TOLERANCE
C. MIZUMOTO and M. IWANE Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, Sept. 1985, p. 105-120. In Japanese, with abstract in English. refs

Two experiments evaluating the G tolerance of ten men ranging in age from 21-32 years are described. Four men were subjected to G force and their tolerance was estimated, and the other six men performed circuit weight training (CWT). Graphs of G tolerance changes for the ten subjects are presented and analyzed. The data reveal that exposure to G force once a week for four weeks does not affect G tolerance. In the men subjected to CWT for eight weeks, four men increased their G tolerance by 0.5-0.8 G, one displayed no change in tolerance, and the sixth decreased G tolerance by 0.4G; a correlation between femoral muscle strength and G tolerance is observed. It is concluded that short periods of CWT will increase peak G tolerance. I.F.

A86-28099#
CHANGES IN CATECHOLAMINE EXCRETION DURING PHYSICAL AND MENTAL WORKLOAD
A. NAKAMURA, Y. KAKIMOTO, T. SAKAGUCHI, I. SAKURAI, F. TAJIMA et al. Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, Sept. 1985, p. 121-129. In Japanese, with abstract in English. refs

The excretion of norepinephrine and epinephrine in four male subjects exposed to physical and mental work is evaluated. The physical exercise involved running and the bicycle ergometer, and the mental work included the addition of digits, span of attention and preposition cancellation tests, and instrument reading. The preparation of the urine samples and the catecholamine analysis are described. Graphs displaying the amount of norepinephrine and epinephrine excreted following work are presented. The data reveal that norepinephrine excretion is increased significantly with physical work and epinephrine is increased during mental work. I.F.

A86-28100#
EFFECTS OF PHYSIOLOGICAL AND MENTAL STRESS ON CREW MEMBERS IN RELATIVELY LONG FLIGHT BY C-1 JET TRANSPORT AIRCRAFT
Y. KAKIMOTO Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, Sept. 1985, p. 131-155. In Japanese, with abstract in English. refs

The relationship between physical and mental work and crew response is examined. The age and flying experience of the crew members, and the thermal conditions and noise level in the cockpit are described. The heart rate, critical flicker frequency (CFF), salivary cortisol level, adrenalin excretion, and fatigue level of the pilots and copilots during operation and nonoperation are evaluated. The data reveal that the heart rate of both pilots and copilots increases during takeoff and landing. During cruise the pilots heart rate is constant; however, the copilots display an increase in heart rate revealing a correlation between heart rate and flying experience. The salivary cortisol response is parallel to the heart rate changes. It is detected that the adrenalin level in the copilots increases with operation and in the pilots it remains unchanged. The CFF in the pilots is unchanged and in the copilots a lower level is observed; the pilots are subjected to increased fatigue compared to the copilots. It is concluded that the pilots remain alert by maintaining constant levels during operation and nonoperation, and that copilots could adapt to long flight missions with increased flight experience. I.F.

A86-28122
AFTERDROP OF BODY TEMPERATURE DURING REWARMING - AN ALTERNATIVE EXPLANATION
P. WEBB (Webb Associates, Yellow Springs, OH) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Feb. 1986, p. 385-390. refs
(Contract N00014-72-C-0057; N00014-80-C-0193)

The effect of the rate of body cooling and rewarming on afterdrop (a continued fall of deep body temperatures during rewarming) was investigated in healthy men subjected to either a rapid cooling-immediate rewarming, a rapid cooling-delayed rewarming, or a slow, prolonged cooling-immediate rewarming regimen. Typical afterdrops in the rectal, esophageal, and auditory canal temperatures were observed in the case of rapid cooling-immediate rewarming regimen, but not in the two other regimens. Afterdrops were also observed in two inanimate models with no circulation. These results make the circulatory explanation of afterdrop improbable. Instead, afterdrop can be explained by the simple rules of heat flow through a mass of tissue. I.S.

A86-28123
EFFECTS OF BODY MASS AND MORPHOLOGY ON THERMAL RESPONSES IN WATER
M. M. TONER, M. N. SAWKA, M. E. FOLEY, and K. B. PANDOLF (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Feb. 1986, p. 521-525. refs

Effects of body mass and surface area on thermal responses to 1-h long immersion into 26-C water were studied in two groups of men, similar in total body fat and skinfold thicknesses, but different in other body characteristics. The large-body mass (LM) group was 16.3 kg heavier and 0.22 sq cm/kg smaller in surface area-to-mass ratio, A(D)/wt, than the small-body mass (SM) group. Metabolic rate (M), and the rectal, skin, and esophageal temperatures, (Tre, Tsk, and Tes) were measured at the end of 1-h periods of rest and exercise in water. While the M, Tre, Tes, and the calculated, value of tissue insulation were similar in both groups after exercise, the value of tissue insulation was lower in the SM group, indicating that a greater body mass increases the overall tissue insulation during rest, when the perfusion of the muscle mass is relatively low. The effect of A(D)/wt in thermoregulation in water appeared to be minimal. I.S.

A86-28125* Medical Coll. of Virginia, Richmond.
DEVICE FOR RAPID QUANTIFICATION OF HUMAN CAROTID BARORECEPTOR-CARDIAC REFLEX RESPONSES
J. M. SPRENKLE, D. L. ECKBERG, R. L. GOBLE, J. J. SCHELHORN, and H. C. HALLIDAY (USVA, Medical Center; Virginia, Medical College, Richmond) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, Feb. 1986, p. 727-732. USVA-supported research. refs
(Contract NAS9-16046; NCH-HL-22296)

A new device has been designed, constructed, and evaluated to characterize the human carotid baroreceptor-cardiac reflex response relation rapidly. This system was designed for study of reflex responses of astronauts before, during, and after space travel. The system comprises a new tightly sealing silicon rubber neck chamber, a stepping motor-driven electrodeposited nickel bellows pressure system, capable of delivering sequential R-wave-triggered neck chamber pressure changes between +40 and -65 mmHg, and a microprocessor-based electronics system for control of pressure steps and analysis and display of responses. This new system provokes classic sigmoid baroreceptor-cardiac reflex responses with threshold, linear, and saturation ranges in most human volunteers during one held expiration. Author

A86-28448
ESTIMATING THE SMALL AIRWAYS RESISTANCE FROM MEASUREMENTS OF THE UPSTREAM RESISTANCE OF SEVERAL GAS MIXTURES
D. B. REYNOLDS and B. BRUNS (Wright State University, Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 992, 993. refs

Based on measurements of the maximal expiratory flow-volume (MEFV) for air and for He-O2, a theory and methods are developed to extrapolate the upstream resistance, i.e. the resistance of airways peripheral to the equal pressure point of maximal expiration, to the zero gas density limit. In so doing, the purely viscosity dependent portion of the upstream resistance is obtained. This viscosity dependent part provides an estimate of the small airway resistance. D.H.

A86-28813
COUNTERMEASURES FOR THE EFFECTS OF PROLONGED WEIGHTLESSNESS
D. WOODARD (Wright State University, Dayton, OH) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 655-663. refs
(AAS 84-187)

The need for artificial gravity during interplanetary flight could be eliminated by practical countermeasures to the degenerative changes induced by prolonged weightlessness. Current countermeasures are time-consuming, difficult to sustain, and only partially effective. Ground-based research suggests that the forms of exercise currently in use in space are not appropriate for maintaining muscle and bone strength, and that isokinetic exercise applying a maximal effort against a high resistance would be much more effective. Bone loss could be further reduced by use of anabolic steroid hormones. These appear safe and effective in reversing osteoporosis on earth. It is estimated that with these measures significant atrophic changes could be prevented with only about 30 minutes of exercise per day. An experiment to test these measures in earth orbit is proposed. Author

A86-29091* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMMUNOLOGICAL ANALYSES OF U.S. SPACE SHUTTLE CREWMEMBERS
G. R. TAYLOR, L. S. NEALE, and J. R. DARDANO (NASA, Johnson Space Center, Houston, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 213-217. refs

Changes in the immunoresponsiveness of 'T' lymphocytes following space flight have been reported previously. Additional data collected before and after 11 Shuttle space flights show that absolute lymphocyte numbers, lymphocyte blastogenic capability, and eosinophil percent in the peripheral blood of crewmembers are generally depressed postflight. These responses resemble those associated with physical and emotional stress and may not be related to flight per se. Additional data from Space Shuttle flights 41B and 41D, involving 11 crewmembers, indicate a postflight decrease in cells reacting with 'B' lymphocyte and monocyte monoclonal antibody tags. Further, the loss of 'T' lymphocyte blast capability correlates with the decreased monocyte count (correlation coefficient = 0.697). This finding implies that the previously reported loss of blastogenic capability may be a function of decreased monocyte control, as noted in several nonspaceflight related studies. Author

A86-29093* Brandeis Univ., Waltham, Mass.
THE EFFECTIVE INTENSITY OF CORIOLIS, CROSS-COUPLING STIMULATION IS GRAVITOINERTIAL FORCE DEPENDENT - IMPLICATIONS FOR SPACE MOTION SICKNESS
J. R. LACKNER and A. GRAYBIEL (Brandeis University, Waltham, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 229-235. refs
(Contract NAS9-15147)

The effect of gravity on the severity of the Coriolis-induced motion sickness was investigated in ten individuals subjected to high and low G-force phases of parabolic flight maneuvers using constant level Coriolis, cross-coupled angular acceleration stimulation. Using seven levels of severity in the diagnosis of motion sickness, it was found that the subjects were less susceptible at 0 G than at +2 Gz, and that the perceived intensity and provocativeness of Coriolis stimulation decreased in 0 G and increased in +2 Gz relative to the +1 Gz baseline values. The changes in the apparent intensity of Coriolis stimulation occur virtually immediately when the background gravitatioinertial force level is varied. These findings explain why the Skylab astronauts were refractory to motion sickness during Coriolis stimulation in-flight. I.S.

A86-29094
TRANSDERMAL SCOPOLAMINE - HUMAN PERFORMANCE AND SIDE EFFECTS
C. GORDON, J. ATTIAS, A. ROLNICK (Isreal Navy, Motion Sickness Research Center, Haifa), and O. BINAH (Israel Navy, Motion Sickness Research Center; Technion Israel Institute of Technology, Haifa) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 236-240. refs

The effect of transdermal scopolamine on performance was tested on 23 naval volunteers. Performance was evaluated by using a battery of professional (naval-related) and cognitive tests. For all tests performed, there were no significant differences between the scores obtained in placebo and transdermal scopolamine conditions. These results were in close agreement with subjective estimations of performance. Transdermal scopolamine significantly reduced salivary flow, whereas mood state, visual acuity, and eye accommodation for near vision were not affected. It is concluded that transdermal scopolamine administration is not accompanied by decrement in performance abilities and can safely be used by naval crews. Author

A86-29306
THE STATE OF MAN'S ORGANISM UNDER CONDITIONS OF ELEVATED ATMOSPHERIC CARBON DIOXIDE [SOSTOIANIE ORGANIZMA V USLOVIIAKH VOZDUSHNOI SREDY S POVYSHENNYM SODERZHANIEM UGLEKISLOGO GAZA]
V. G. ALTUKHOV, M. A. GREBENIK, and A. A. SHAPOVALOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Dec. 1985, p. 43, 44. In Russian.

Effects of elevated atmospheric CO2 were studied in three groups of men subjected to prolonged habitation in atmospheric chambers equilibrated with CO2 at the levels of (1) 0.80 percent, (2) 0.60 percent, and (3) 0.25 percent, respectively. Various physiological parameters, as well as the results of mental acuity tests and subjective evaluations of wellbeing, recorded every 10 days during the exposure and at the end of several 10-day periods after the test, were compared with the pre-test results. While the 0.25 pct CO2 atmosphere did not adversely affect psychophysiological status of the subjects, the two regimens with higher CO2 contents have led to marked increases of mental and physical fatigue signs, which were preceded by an increase of partial CO2 pressure in the alveolar air and a drop in blood pH. I.S.

A86-29499
CONCERNS ARE BEING RAISED ABOUT LIVING IN THE SPACE ENVIRONMENT
W. L. GIUFFRE Commercial Space (ISSN 8756-4831), vol. 1, Winter 1986, p. 69, 70.

An evaluation is made of current understanding and outstanding problems in the field of physiological adaptation to weightless environments. The primary concerns associated with long duration space flight encompass motion sickness and disorientation, muscle atrophy, bone decalcification, and radiation exposure. Data that are currently being analyzed from the Spacelab mission D1 may show that the process of readaptation into earth gravity does not occur as rapidly as had been thought. It is noted that while space motion sickness drugs are helpful, they are not completely preventive. Future NASA planning stresses the importance of physical exercise. O.C.

N86-20628# Army Missile Command, Redstone Arsenal, Ala.
EFFECTS OF CARBON MONOXIDE ON PERSONNEL
M. MOSSA *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1309-1341 Aug. 1984
(AD-P004882) Avail: NTIS HC A99/MF E03 CSCL 13L

New weapons and the vehicles on which they mount have and will continue to become increasingly complex. These weapons are potentially more demanding, and challenges need to be addressed. One important challenge is the need to accurately monitor and control the amount of toxic substances, generated by weapon systems, that may endanger the soliders who will operate the systems. Toxic fumes generated from various sources can have debilitating effects on the efficiency of occupants and operators of vehicles and ground equipment. The insidious nature of these effects underscores the necessity for detecting, measuring, and eliminating these hazards to the extent possible. The overall problem that must be addressed is the potential exposure of soldiers to carbon monoxide, ammonia, oxides of sulfur, oxides of nitrogen, lead fumes, and other harmful substances. The exposures are likely to be relatively intense (above present Federal standards for occupational exposure), brief (1 hour or less), and rapidly repeated (as often as six times daily for periods as long as 14 days). Such exposures may occur when soldiers are trained to use various weapon systems or while in combat. GRA

N86-20629# Army Materiel Command, Aberdeen Proving Ground, Md.
AN EXAMINATION OF INJURY CRITERIA FOR POTENTIAL APPLICATION TO EXPLOSIVE SAFETY STUDIES
D. N. NEADES and R. R. RUDOLPH *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1343-1354 Aug. 1984
(AD-P004883) Avail: NTIS HC A99/MF E03 CSCL 13L

A state-of-the-art assessment of research into and the modeling of wounding mechanisms and phenomena is described. The results of an extensive survey of the literature are presented along with recommendations for replacement of the presently used 58 ft-lb rule. The data and models located have been evaluated with respect to applicability to explosive safety studies which typically require quantification of the fragment impact hazards to personnel. Major topics for discussion include penetrating and non-penetrating injury mechanisms and models, wounding thresholds, military incapacitation criteria, and existing safety criteria, as well as recommendations for formulation of new criteria. Author (GRA)

N86-21013 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
NEUROPHYSIOLOGICAL ACTIVITY AND PSYCHOPHYSICAL EFFECTIVENESS OF ENVIRONMENTAL FACTORS [NEUROPHYSIOLOGISCHE VERARBEITUNG UND PSYCHOPHYSISCHE WIRKSAMKEIT VON UMWELTEINFLUESSEN]
W. H. EHRENSTEIN *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 1-5 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The sensorial transmission of the body/environment relationship is presented as well as the correlation between subjective and objective data through sensorial organs. The correlation investigation method is successfully applied to vision investigation to study the neurophysiological activity and psychophysical effectiveness of environmental factors. Further application of the psychophysiological concepts and methods presented is recommended for medical meteorological research. The investigation of qualitative relationships using impression scales is recommended to determine the central processes in the psychological assessment of the environmental factors.
Author (ESA)

N86-21014 Max-Planck-Inst. fuer Physiologische und Klinische Forschung, Bad Nauheim (West Germany).
THE INTERFACE BETWEEN ATMOSPHERE AND ORGANISM
F. K. PIERAU *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 6-8 13 Aug. 1985 refs
Avail: Issuing Activity

The effects of temperature, air currents, and humidity on the human body and the stimulation of skin receptors are studied. The somatosensory processes underlying the communication between man and his environment and the relay of sensory information into the central nervous system are discussed. The transformation of temperature and mechanical signals into bioelectric signals (generation of a depolarizing nonpropagated receptor potential), the encoding of the stimulus features and the principles of processing in the central nervous system are reviewed. Mechanisms to detect air humidity by nasal and/or hypothalamic temperature receptors (slowly adapting and rapidly adapting mechanoreceptors) are discussed. The high sensitivity (transient and proportional) of temperature receptors is used to sense changes in air humidity. Sudden increase of nasal temperature may contribute to sensation of humidity. Author (ESA)

N86-21016 Dortmund Univ. (West Germany). Inst. fuer Arbeitsphysiologie.
MAN'S THERMAL BUDGET UNDER VARIOUS CLIMATES [WAERMBEBILANZ DES MENSCHEN IN VERSCHIEDENEN KLIMATEN]
H. G. WENZEL *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 12-16 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Facts on man's thermoregulation system, conditioning, clothing and food requirements, on heat transfer through blood and skin, and metabolism are presented. Physiological processes of autonomous thermoregulation are described. Boundary conditions based on rectal temperature variations under heavy climates are studied to determine man's tolerance to heat stroke and heat stress (sensations of uneasiness, drop in corporal and psychological efficiency, specific health troubles). Author (ESA)

N86-21017 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
APPLICATION OF A NONSTATIONARY ENERGY BUDGET MODEL TO DETERMINE THERMAL COMFORT [ANWENDUNGSMOEGLICHKEITEN EINES INSTATIONAEREN ENERGIEBILANZMODELLS ZUR BEWERTUNG DER THERMISCHEN BEHAGLICHKEIT]
P. HOEPPE *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 17-18 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

A nonstationary energy budget model based on the fundamental energy flux equations is applied to determine heat stress and heat storage under variable environmental conditions. Temperature variations in the body core and shell are calculated. A man walking on a 200 m long sunlit street section at a speed of 0.4 m/sec dressed in light summer clothing is exposed to 3 min direct sun radiation and street surface radiation. No sultriness is noted with the nonstationary model. Nonstationary energy budget models can be applied for cold and warm therapy since they can give information on the optimal exposure times to reach a given thermal body condition. Author (ESA)

N86-21018 Fraunhofer-Inst. fuer Bauphysik, Stuttgart (West Germany). Institutsbereich Waerme/Klima.
PHYSICAL CAUSES OF AIR DRAFT PHENOMENA, NEW FACTS [PHYSIKALISCHE URSACHEN FUER ZUGERSCHEINUNGEN - NEUE ERKENNTNISSE]
E. MAYER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 19-20 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The physical causes of air draught phenomena causing health troubles are analyzed (especially man's local convective cooling resulting in a surface temperature decrease) as well as the relationship between convective heat transfer factor and thermal comfort. Measurements of convection on a heated artificial head show a parabolic correlation between self-convection and the product of air velocity mean value with turbulence degree and convective heat transfer factor. The area under the hyperboles corresponds to thermal comfort. Measurements were performed in buildings with and without air conditioning. Experimental results show good agreement with inquiry results. More cases of air draft troubles are recorded in buildings with air conditioning than in buildings without air conditioning. Convective heat transfer factor is better adapted to thermal comfort evaluation than air velocity mean value. Author (ESA)

N86-21019 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
CLIMATIC CURE ON A PRACTICAL LEVEL [KLIMATUR IN DER PRAXIS]
A. SCHUH *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 21-22 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

About 150 patients were submitted to cardiovascular training and thermoregulatory training during their cure period to improve their response to climatic stimuli by applying ambulatory therapy. Pulse and blood pressure were measured to determine the physiological reaction and eye stress under climatic conditions. Patients were taught the thermoregulation system so as to react economically to climatic conditions. They were interrogated on their thermal comfort during the walk. Lactate formation and rewarming time were measured. Improved response to cold stimuli can be achieved with the application of this form of climatic cure combining cardiopulmonar training and thermoregulatory training.
Author (ESA)

N86-21020 Meteorologischer Dienst der DDR, Berlin (East Germany). Forschungsinst. fuer Bioklimatologie.
ON THE IMPORTANCE OF COOLING IN CLIMATIC THERAPY [ZUR BEDEUTUNG DER ABKUEHLUNG IM RAHMEN DER KLIMATHERAPIE]
L. KLINKER and E. TUROWSKI *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 23-24 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The effects of meteorological cold stimuli under constant social environment before, during, and after a cold air resting cure with whole body stress are analyzed. Resistance and vegetative transposition are reflected by an increase in the resting time for a cooling value of 188 kJ/sq m and by an increased excretion of creatinine and of a subsitute product of adrenalin and noradrenalin. Increased blood pressure in cold pressure test, blood pressure fall to 5 to 15 mm, pulse frequency drop to 1.5 per min. and a drop in flicker fusion frequency and in the pupillary aperture are recorded during the acclimatization period. A better use of oxygen is observed during cooling therapy. Dosage recommendations for the different groups of patients according to their sensitivity to cold conditions are given. Author (ESA)

N86-21021 National Inst. for Rheumatics and Physiotherapy, Budapest (Hungary).
THE INFLUENCE OF HELIOMETEOROLOGIC FACTORS ON CIRCULATION AND SOME VEGETATIVE FUNCTIONS
I. OERMENYI *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 25-26 13 Aug. 1985
Avail: Issuing Activity

Solar effects on circulation and vegetative functions were studied based on daily measurements of the systolic and diastolic blood pressure (SBP and DBP), and the arterial pulse number (APN) of 112 patients and 11 control individuals leading to a vegetative Index (VI). If VI is positive, sympathetic reactions increase; if VI is negative, parasympathetic reactions increase. Weather data and chromospheric flares are taken into account. The SBP and DBP increase during cold front passage, upper or lower, and during anticyclonic weather formation. The APN increases in presence of higher troposphere subtropical air. Tropospheric coding and continental cold air cause increased parasympathetic reactions. The latter increase in accordance with the direction of weather and geoactive solar activity. Sympathetic-like reactions appear with increased solar radio noise level around 200 MHz and 19 Ghz. The results of the study are used in forecasting physiological effects for public health. Author (ESA)

N86-21022 Institute of Meteorology and Water Management, Podlesna (Poland). Dept. of Climatology.
METEOROTROPIC DETERMINANTS OF ROAD COLLISIONS AND ACCIDENTS
M. BARANOWSKA and B. GABRYL-WOJTACH *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 27-28 13 Aug. 1985 refs
Avail: Issuing Activity

The effects of traffic intensity fluctuations and rainfall and fog on human psychophysical performance are studied based on statistics of daily number of road collisions and accidents (Lkw) over a period of 8 yr. Correlation is found between Lkw and rainfall but not between Lkw and duration of fog. The relationship between Lkw and basic systems and atmospheric fronts as well as the influence of extreme environmental changes are investigated. A significant increase of accidents is noted during strong front passages. A correlation is noted between Lkw statistics and cyclonal processes and extreme environmental changes, whatever the seasonal rhythm. Author (ESA)

N86-21023 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Neurochirurgische Ambulanz am Ambulatorium. Sued.
OBJECTIVE INVESTIGATIONS AND SUBJECTIVE OBSERVATIONS OF SENSITIVITY TO WEATHER [OBJEKTIVE UNTERSUCHUNGEN UND SUBJEKTIVE BEOBACHTUNGEN UEBER WETTERFUEHLIGKEIT]
F. J. JENKNER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 29-30 13 Aug. 1985 In GERMAN
Avail: Issuing Activity

The following criteria were investigated in 4,000 patients (women: 68%, men: 32%); sex, sensitivity to weather, light or painful troubles, shorter or longer period, with normal or increased blood, sedimentation rate, vertigo, headaches, lymphocyte count, pherogram, lymphocytosis. Women are more sensitive to weather changes than men with a higher frequency and increased blood sedimentation rate. Sensitive patients with a frequency of 75% for women and 25% for men have more painful troubles, a longer anamnesis period, more migraine and vertigo and a delay of the ovalbumin fraction. In insensitive patients the frequency is 62% for women and 38% for men. Further investigations are recommended to elicit the reasons of the statistically based differences. Author (ESA)

N86-21024 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
COLLOIDAL AND METEOROLOGICAL IN VITRO REACTIONS
N. PLESKO *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 31-32 13 Aug. 1985 refs
Avail: Issuing Activity

A reaction measuring system was developed to determine the effects of differential mean mole weight colloids, and to investigate the state variations of colloidal systems in correlation with solar-terrestrial phenomena. The relationships between solar terrestrial phenomena and the measurement variations, and between the measurement variations and weather sensitivity in healthy and ill people are investigated. The measured data corrected by the two relationships can then be applied for prevention in medicine, transport, and industry. The closed measuring system is insensitive to vibrations, gravity, and temperature stable when stored, and automatically performs the measurement of large molecular polyvinylpyrrolidon (PVP) in solutions with few electrolytes. The pseudopolarization effects depend on the adsorption layer thickness due to the degree of association of dissolved PUP molecules and to solar terrestrial factors. Author (ESA)

N86-21025 Universitaetsspital, Zurich (Switzerland). Biologisches Zentrallaboratorium.
WEATHER SENSITIVITY AS DISCOMFORT [DIE WETTERFUEHLIGKEIT ALS DISKOMFORT]
W. H. WEIHE *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 35-37 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Weather sensitivity due to a thermal imbalance between environment and organism leads to uneasiness or discomfort. Subjective and cognitive processes trigger the behavorial temperature regulation in order to sustain the autonomous physiological regulation. The behavorial temperature regulation can influence healing or aggravate the discomfort condition. Ill behavorial attitudes (unadapted dressing, inactivity, unbalanced eating and drinking, environment changes, etc.) are modified with training, decisiveness, will power, self-confidence and education. Weather sensitivity appears when individuals cannot perceive the relationship between thermal load error and temperature preferred conditions. Pharmacotherapy is recommended for special cases only. Further investigation of weather sensitivity is recommended to check the identity between sensitivity and thermal discomfort under natural weather changes. Individuals should be taught temperature balance. Author (ESA)

N86-21026 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
WEATHER AS A PHYSICAL PROCESS AND PARAMETERIZATION OF THE EFFECTS AS A METEOROLOGICAL CONTRIBUTION FOR INVESTIGATING THE CORRELATION BETWEEN WEATHER AND MAN [DAS WETTER ALS PHYSIKALISCHE PROZESS UND SEINE WIRKUNGSRELEVANTE PARAMETRISIERUNG ALS METEOROLOGISCHER BEITRAG ZUR UNTERSUCHUNG DER BEZIEHUNG WETTER - MENSCH]
K. BUCHER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 38-41 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Use of meteorological parameters as causal parameters for medical research on thermoregulatory troubles due to atmospheric processes is discussed. They can be used for characterization of specific atmospheric processes. An objective classification of meteorological parameters is based on biotropy influenced by weather change intensity and pressure areas and on the characterization of the transition areas between systems with differential air pressure. Air temperature and humidity changes are investigated for quantification of the description of meteorological processes. The change of the atmospheric dynamic relations determined by statistical investigations based on factor analysis influences the meteorological parameters measured near the ground. Author (ESA)

N86-21027 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria). Ambulatorium Sued.
WEATHER AND MIGRAINE [WETTER UND MIGRAENE]
F. L. JENKNER and A. MACHALEK *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 43-44 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The relationship between headache intensity and weather situations is investigated statistically based on forms filled in by 80 ambulent patients suffering from migraine from April to September 1982. The correlations are determined using univariant methods (correlation and regression analysis) and parameter-free methods (Chi-squared test and U-test) with respect to high pressure and low pressure weather situations, even pressure distribution, variable weather, and southern circulation form. Almost 60% of the patients are sensitive to weather. Less cases of high intensity headaches occur under low pressure weather conditions than under anticyclonal and zonal circulation weather situations. More serious headaches occur under atmospheric subsidence. No reliable statistical results can be obtained due to the medical data inhomogeneity. Improved terminology of bioweather situations should give more accurate data on the relationship between headache intensity and frequency and weather. Author (ESA)

N86-21028 Hydrometeorological Inst. of the Socialist Republic of Croatia, Zagreb (Yugoslavia).
TEMPERATURE WIND SPEED HUMIDITY (TWH): A BIOMETEOROLOGICAL INDEX TESTING
K. ZANINOVIC *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 45-46 13 Aug. 1985 refs
Avail: Issuing Activity

The temperature, wind velocity, humidity index (TWH) based on measured values of temperature, wind speed and air humidity, on Hill's equations for cooling power, and on Brazol's sensation scale is tested for extreme temperature conditions to assess thermal sensation and its applicability in bioclimate evaluation. The TWH was compared with air enthalpy average values of a 10-day period during 10 yr. The TWH index including wind cooling effects gives better results than air enthalpy. It reinforces the sensation of cold in winter and smoothes the sensation of warmth in summer mornings and evenings. Author (ESA)

N86-21029 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
WEATHER AND ASTHMA SYMPTOMS [WETTER UND ASTHMASYMPTOMATIK]
J. LECHELER and M. VOELKER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 47-48 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The influence of weather-dependent environmental factors outside the laboratory on asthma was investigated based on the observation of 46 heavily asthmatic children and teenagers undergoing a long therapy at 1200 m. Peak-flow forms are filled in indicating their lung function every morning and evening. The values are compared with those of the weather station with respect to temperature, air humidity, sunshine, rainfall amount in mm, and atmospheric pressure. Correlation is noted between peak flow measured lung function values and monthly average temperatures and average insolation time. A relationship between temperature collapses and lung function worsening is noted. During the first months of summer the influence of the weather-dependent factors is added to the allergy stress. A 2 yr observation time is recommended to obtain more accurate results. Author (ESA)

N86-21030 Central Meteorological Service, Peking (China).
STUDY OF A METEOROLOGICAL PREDICTION OF ACUTE MYOCARDIAL INFARCTION INCIDENCE
Y. WANG and X. ZHANG (Lianyungang Ocean Station, China) *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 49-50 13 Aug. 1985 refs
Avail: Issuing Activity

The relationship between acute myocardial infarction incidence and weather in Beijing area is investigated. Excitation weather event and mitigating weather situation effects are analyzed to draw prediction model charts for infarction incidence. The whole-year synoptic situation is split into 65.5% for mitigating weather situation and 34.5% for excitation weather events. The disease occurrence is associated with cold front passage, low temperature, and high wind situations. Severe cold air before the front edge of cold high situation without any cold front passage is sufficient to affect a patient. Association of excitation weather event and precipitation eliminates the harmful effect. Further study of the disease inducement effects of excitation weather events is recommended. Author (ESA)

N86-21031 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
METEOROTROPIC CHANGES OF CARDIAC PATIENTS' BLOOD PRESSURE AND PULSE FREQUENCY DURING A COMPLEX BATH CURE [METEOROTROPE VERAENDERUNGEN DES BLUTZUCKERS UND DER PULSFREQUENZ DER HERZKRANKEN IM VERLAUF DER KOMPLEXEN BAEDERKUR]
V. KVETON, J. MATOUSEK, and Z. SEBESTA *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 51-52 13 Aug. 1985 In GERMAN
Avail: Issuing Activity

Air temperature, air humidity, and barometric pressure effects on cardiac patients' blood pressure (systolic and diastolic) and pulse frequency were investigated during a complex bath cure using multidimensional linear regression analysis. The cure includes climatotherapy, diet, balneological and physical therapy, kinesetherapy, group training, and cycling. The barometric pressure influences the systolic and diastolic blood pressure. Daily temperature magnitude and passage from anticyclonal to zonal weather influence the pulse frequency. The synoptic coupling of biotropic efficient meteorological factors is assessed to deduce synoptic weather situations influencing the patients' blood pressure and pulse frequency. Author (ESA)

N86-21032 Forschunginstitut fuer Balneologie, Marianske Lazne (Czechoslovakia).
WEATHER AND SUBJECTIVE HEALTH COMPLICATIONS IN CARDIAC PATIENTS [DAS WETTER UND DIE SUBJEKTIVEN GESUNDHEITSSCHWIERIGKEITEN DER HERZKRANKEN]
V. KVETON *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 53-54 13 Aug. 1985 In GERMAN
Avail: Issuing Activity

The relationship between daily occurrence of complications in cardiac patients and the atmospheric environment (air pressure, air humidity, wind velocity, temperature) is analyzed based on data of 2 yr observation of patients suffering from myocardial infarction. Stress of the thermoregulatory system as well as ground meteorological elements increase the biological reaction. The deviation of the relative daily occurrence is determined for chest troubles and respiratory distress at rest and during walking, for heart beat, and exhaustion and fear situations with respect to sunshine, jog, rain, and bad weather conditions. Author (ESA)

N86-21033 Deutscher Wetterdienst, Offenbach am Main (West Germany).
INVESTIGATIONS OF THE POSSIBLE INFLUENCE OF AIR ELECTRICAL PHENOMENA ON DULLING AND GHOST ACHING IN AMPUTATED PATIENTS [UNTERSUCHUNGEN UEBER EINEN MOEGLICHEN EINFLUSS VON LUFTELEKTRISCHEN ERSCHEINUNGEN AUF STUMPF- UND PHANTOMSCHMERZEN BEI AMPUTIERTEN]
J. PELZ (Freie Univ., Berlin, West Germany) and H. J. SWANTES *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 55-56 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The effects of air electricity on dulling and ghost aching in amputated patients are investigated based on written patients' complaints, weather observations in weather stations, and on automatic measurement of the atmospheric impulse radiation. Ghost aching geographical distribution is shown statistically. Ghost aching occurrence increases parallel to increased impulse radiation. Dulling troubles have a similar distribution as the occurrence distribution. The occurrence geographical distribution of aching complaints per month and per patient from 1976 to 1979 is investigated, leading to a mapping of the complaint locations. The correlation between bad weather occurrence and aching occurrence cannot be made. The same mapping can be made for dulling troubles. Author (ESA)

N86-21034 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
THE AUSTRIAN BIOMETEOROLOGICAL SERVICE [DER OESTERREICHISCHE BIOWETTERDIENST]
A. MACHALEK and P. SABO *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 57-58 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The bioweather research project to analyze the effects of weather on healthy and sick persons is described. The investigation is based on high pressure weather; even pressure distribution; low pressure situation; western and north-western weather situation; southern and South-Western weather situation as well as on cold air incursions in ground and medium layers of the atmosphere and on atmospheric depression. Application of Bioweather requires the partition of Austria in bioweather areas according to bioclimatic conditions. Author (ESA)

N86-21036 Jugenddorf Christophorusschule, Berchtesgaden (West Germany). Asthmatherapiezentrum.
HEIGHT-DEPENDENT REDUCTION OF AIRBORNE POLLEN AND EFFECTS ON CHILDREN AND TEENAGERS AFFECTED BY BRONCHIAL ASTHMA [HOEHENABHAENGIGIGE REDUZIERUNG DES POLLENFLUGS UND DIE AUSWIRKUNG AUF KINDER UND JUGENDLICHE MIT ASTHMA BRONCHIALE]
J. LECHELER, M. VOELKER, and R. WINKLER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 63-64 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Forty asthmatic children and adolescents with seasonal sensitization and rhinoconjunctivitis were monitored and their symptomatology compared during the pollinosis season. The comparison shows a significant reduction of the bronchial symptomatology as well as of the allergic rhinoconjunctivitis due to a reduced allergen influx resulting from reduced airborne pollen in high mountains. Disappearance of the perennial allergens, better monitoring, and therapy optimization account for bronchial improvement. The seasonal allergen effects are reduced by height-dependent reduced airborne pollen. Author (ESA)

N86-21038 Duesseldorf Univ. (West Germany). Medizinisches Inst. fuer Umwelthygiene.
EFFECTS OF AIR POLLUTION ON MAN [WIRKUNG VON LUFTVERUNREINIGUNGEN AUF DEN MENSCHEN]
H. W. SCHLIPKOETER and K. BEYEN *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 67-69 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Air pollution and airway diseases; effects of carbon monoxide on healthy and cardiac people; effects of smog on old people affected by serious airway and blood circulation diseases and effects of heavy dust; heavy metal effects of babies, and young children (neurophysiological troubles); effects of cadmium on old people's renal function; and air pollution and lung cancer due to polycyclic aromatic carbon monoxides are discussed.
Author (ESA)

N86-21039 Giessen Univ. (West Germany). Hygiene-Inst.
GROUP DIAGNOSIS AS RISK ASSESSMENT IN ENVIRONMENT HYGIENE [GRUPPENDIAGNOSTIK ALS RISIKOABSCHAETZUNG IN DER UMWELTHYGIENE]
P. SCHMIDT and E. G. BECK *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 70-71 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Group diagnosis based on clinical epidemiology, laboratory investigation, and anthropological and statistical methods is performed for risk assessment and to determine the correlation between health, development maturity, living habits and environment pollution. An epidemiological investigation on a group of clinically healthy 10 yr old children over 5 yr shows that children in an urban air-polluted area have more enlarged lymphatic nodes, fewer red blood cells and hemoglobin, fewer antibodies, and are more sensitive to stress than children in relatively pure air areas.
Author (ESA)

N86-21040 Freie Univ., Berlin (West Germany). Rittberg-Kinderklinik.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY ILLNESSES IN BERLIN (1979-1982): METHODOLOGY AND RESULT SUMMARY [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). METHODIK UND ERGEBNISUEBERBLICK]
U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 72-74 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The possible acute effects of inhalative air pollution and of meteorological environmental factors on the morbidity rate of children's upper and lower airway illnesses listed in four diagnosis groups (pseudo Croup, bronchitis-pneumonia, asthma, and influenza) are reviewed with respect to immission parameters. Independent variables (SO2 concentration, equivalent temperature, interdiurnal air pressure, and relative indoor humidity) are linearly correlated with morbidity rate in monthly, weekly, and daily mean values. Air pollution immission and meteorological parameters influence the course of the infection rate of upper and lower airway illnesses. They have hazardous effects on the respiratory tissue separately or combined. Assumptions on the influence on infection rates of air chemical and thermal complex are given for Croup syndrome and asthma. Author (ESA)

N86-21041 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
ENVIRONMENTAL FACTORS AND INFANT MORTALITY [UMWELTFAKTOREN UND SAEUGLINGSSTERBLICHKEIT]
A. MACHALEK, H. KAPAUN, and E. JUNKER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 75-76 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The Sudden Infant Death Syndrome (SIDS) was studied with respect to air chemistry. Hexachlorobenzol, nitrates in water, and acid rain cause SIDS. The effects of air substances are reviewed. The relationship between airway illnesses and air substances is statistically established for Croup syndrome. No seasonal influence is noted for SIDS. Two correlations are shown (but not statistically): appearance of SIDS culminations during the hot period after biospheric high pollution load and on days with temperature extremes in summer or in winter. Author (ESA)

N86-21042 Gesamthochschule, Kassel (West Germany).
AIRWAY INFECTIONS RELATED TO CITY CLIMATE AND LOCAL IMMISSION LOAD [ATEMWEGSERKRANKUNGEN IN ABHAENGIGKEIT VON STADTKLIMA UND LOKALER IMMISSIONSBELASTUNG]
L. KATZSCHNER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 77-79 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The effects of immission load on infants up to 6 yr old are investigated in relation to climate, airway infections, and SO2 concentration. Air temperature significantly influences the onset of illnesses. Immission data are not sufficient to explain stress situations. Air polluting substances influence the immune system leading to body weakening and to an increased sensitization to viral agents. Author (ESA)

N86-21043 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie und Klimatologie.
WHAT IN HUMAN BIOMETEOROLOGY CAN CONTRIBUTE TO ASSESSMENT OF THE EFFECTS OF HAZARDOUS SUBSTANCES ON HEALTH? [WAS KANN DIE HUMAN-BIOMETEOROLOGIE ZUR BEWERTUNG GESUNDHEITLICHER WIRKUNGEN VON SCHADSTOFFEN BEITRAGEN]
K. DIRNAGL *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 80-81 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Anthropogenic atmospheric influence factors; relativism in the assessment of the quantification of the hazardous effects on health and limit values; a political assessment of quantitative data; and disproportion between measurement and monitoring programs and investigations of the hazardous effects are discussed. Quantitative assessment should be avoided. The popularity gained by scientific results on weather effects on man's health should be used to avoid an erroneous vision of assessment of environmental effects. Author (ESA)

N86-21044 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
IMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). TIME SERIES INVESTIGATIONS: CROUP SYNDROME AND ASTHMATIC AIRWAY TROUBLES [IMMISSIONS- UND WETTEREINFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982) ZEITREIHENUNTERSUCHUNGEN: CROUP-SYNDROM UND ASTHMATISCHE ATEMWEGSERKRANKUNGEN]
U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 82-85 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Croup syndrome and asthma airway troubles in children aged 0 to 6 yr divided into 3 age groups were clinically investigated to determine the effects of immission and weather conditions on the infection percentage according to annual, interannual, and weekly variations, and SO2 concentration periods and days. Croup affection percentage increases from summer to fall, during the cold period due to an increased immission. Linear correlations are made between SO2 concentration, indoor humidity, and infection percentage. Maximum occurrence of asthma affections is in winter and from May to July due to pollen allergens. A positive correlation is made between asthma and SO2 concentration, a negative one between asthma and indoor humidity. The injection epidemiological effect (mycoplasma pneumoniae) is excluded for Croup syndrom. It is taken into account for asthma.
Author (ESA)

N86-21045 Freie Univ., Berlin (West Germany). Inst. fuer Meteorologie.
EMMISSION AND WEATHER EFFECTS ON CHILDREN'S AIRWAY TROUBLES IN BERLIN (1979-1982). COMPARISON OF TWO DIFFERENT IMMISSIONS: LOADED RESIDENTIAL AREAS IN WEST BERLIN POLLUTED AREAS [IMMISSIONS- UND WETTERFLUESSE AUF ATEMWEGSERKRANKUNGEN VON KINDERN IN BERLIN (1979-1982). VERGLEICH ZWEIER UNTERSCHIEDLICH IMMISSIONSBELASTETER WOHNBEREICHE IM BELASTUNGSGEBIET BERLIN (WEST)]
U. FEGELER, R. MOYZES, E. WEDLER, and K. EBERHARD *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 86-87 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Two SO2 emission-loaded residential areas are compared based on affection ratios of children suffering from Croup syndrome and asthma in the two investigation hospitals. More children suffer from asthmatic troubles in a polluted area with SO2 emission over the average than the one with SO2 immission below the

average. More children suffer from Croup syndrome in a polluted area with SO2 emission below the average than in the one with SO2 immission over the average. Author (ESA)

N86-21046 Technische Univ., Munich (West Germany). Inst. fuer Medizinische Balneologie.
AIR QUALITY DETERMINATION IN HEALTH RESORTS [LUFTQUALITAETSBESTIMMUNG IN KURORTEN]
A. SCHUH *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 88-89 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The medium pollution and short-time peak concentration of SO2, CO and other gaseous air constituents were measured to assess air quality in health resorts. The spatial distribution and air constituent content were assessed in weekly analyses of Petri dish sulfur and nitrogen oxide content. The filter was exposed to heavy air pollution to test the measuring procedure. Comparison with the previous concentration measurements shows good agreement with the filter measurements. Author (ESA)

N86-21047 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizinmeteorologische Forschungsstelle.
THE BIOLOGICAL EFFICIENCY OF DUST EMMISSION: DETERMINATION BASED ON THE WITHERING DEGREE OF EXPOSED LICHENS [DIE BIOLOGISCHE WIRKSAMKEIT VON STAUBIMMISSIONEN: ERMITTELT ANHAND DES ABSTERBEGRADES EXPONIERTER FLECHTEN]
R. RABE and E. SCHULTZ *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 90-91 13 Aug. 1985 In GERMAN Prepared in cooperation with Rheinische Westfaelische Technischer Ueberwachungs-Verein e.V., Essen, West Germany
Avail: Issuing Activity

Air hygiene and air quality in cities and health resorts were determined using the method of lichen exposition to dust emmission based on the relationship between lichen withering degree and immission constituent efficiency and their effects on health. Results show good agreement between lichen withering degree and mortality or morbidity. The results are confirmed by epidemiological investigations based on dust foil measurement. A correlation between soot deposition and lichen withering degree is noted. The quantity deposition ratio for particle combustion products allows assessment of air quality in health resorts using the adherence foil method. Author (ESA)

N86-21049 Deutscher Wetterdienst, Offenbach am Main (West Germany).
PROBLEMS OF CITY PLANNING [PROBLEME DER STADTPLANUNG]
B. FROMMES *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 95-98 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The limits of meteorology for city planning; purpose of city and building climatology; architects' and planners' expectations regarding meteorology; and relevance of the meteorological information in planners decision making are discussed. Interactions between climate, buildings and city; and inhabitants' protection against bad weather and health troubles are considered. Author (ESA)

N86-21050 Technische Univ., Munich (West Germany). Lehrstuhl fuer Bioklimatologie und Angewandte Meteorologie.
PROBLEMS IN CITY CLIMATE EVALUATION IN HUMAN BIOMETEOROLOGICAL TERMS [PROBLEMATIK BEI DER HUMANBIOMETEOROLOGISCHE BEWERTUNG DES STADTKLIMAS]
H. MAYER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 99-100 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The city climate is split into air hygiene (city air quality) and thermal components (city air energy) for relevant assessment of the city climate in human biometeorological terms for decision making in city planning. The relations between hazardous substances in the city causing health troubles in man should be further investigated with respect to inner city differentiations (city elements, constructions, entire city districts). Relevant meteorological data include the height of man's center of gravity and spatial radiation field. Author (ESA)

N86-21058 Austrian Automobile Touring Club, Vienna. Medizin-meteorologischer Beratungsdienst.
HUMAN BIOCLIMATIC CLASSIFICATION METHODS ILLUSTRATED WITH EXAMPLES OF SELECTED COUNTRIES [HUMANBIOKLIMATISCHE KLASSIFIZIERUNGSMETHODEN AM BEISPIEL AUSGEWAEHLTER LAENDER]
O. HARLFINGER *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 119-121 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

The analysis of meteorological parameters for tourism, recreation, and outdoor activities with respect to climatic comfort and discomfort is illustrated. Consideration of the thermal hygrometric area using model calculations or bioclimatologically complex factors to determine the boundary between comfort and discomfort; methods for determination of tourist season based on climatic parameters; and a combination of the first two methods with differential weighting of climatic and bioclimatic factors are used in bioclimatic holiday counseling. Author (ESA)

N86-21059 Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
COMPARISON BETWEEN METEOROLOGICAL COMPLEX VALUES AND A MODEL OF MAN'S ENERGY BUDGET [VERGLEICH ZWISCHEN METEOROLOGISCHEN KOMPLEXGROESSEN UND EINEM ENERGIEBILANZMODELL DES MENSCHEN]
N. HAMMER, E. KOCH, and E. RUDEL *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 122-123 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

Heat and cooling parameters are compared to comfort criteria resulting from a model of man's energy budget with respect to sitting, slow and rapid walking, and dressing according to seasons. Assessment using equivalent temperature limits shows good agreement with energy budget methods during a 300 W activity and the cooling factor during a light sport activity. The results show a need for further investigation using the energy budget model to give physicians information on therapeutic applications of climate. Author (ESA)

N86-21064 Deutscher Wetterdienst, Offenbach am Main (West Germany).
LOCAL CLIMATIC PARTICULARITIES AND THEIR IMPORTANCE FOR RECREATION AREA (EXAMPLE, SAARLAND-LOWER BLIESTAL) [LOKALKLIMATISCHE BESONDERHEITEN IN IHRER BEDEUTUNG FUER ERHOLUNGSGEBIETE (AM BEISPIEL SAARLAND-ERHOLUNGSRAUM UNTERES BLIESTAL)]
H. J. SWANTES *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 132-133 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

A medico-meteorological-bioclimatic assessment of Saarland (West Germany) was made for construction of a recreation network. It is based on investigations of local wind circulation and cloud cover and air pollution in valleys. Air temperature and air humidity are measured. Inquiry forms are distributed to farmers, walkers, and highway engineers to obtain further information on local climatic particularities. Results of the measurement and written inquiry campaign are mapped to give information on the investigated area planning and utilization for adequate recreation forms according to bioclimatic criteria. Author (ESA)

N86-21065 Deutscher Wetterdienst, Freiburg (West Germany). Zentrale Medizin-Meteorologische Forschungsstelle.
SPATIAL DISTRIBUTION OF HEAT AND COLD STRESS IN THE FEDERAL REPUBLIC OF GERMANY [DIE RAEUMLICHE VERTEILUNG VON WAERMEBELASTUNG UND KAELTESTRESS IN DER BUNDESREPUBLIK DEUTSCHLAND]
G. JENDRITZKY *In its* Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 134-136 13 Aug. 1985 refs In GERMAN
Avail: Issuing Activity

A stochastic climate model based on data of cooling effects on the thermoregulatory system was developed to design monthly differential climate maps for description of the thermal environment in city and environmental planning. The model is standardized with respect to individual thermoregulation differences, to Sun-shadow difference and to heat loss conditions. The small-scale effects on orography or vegetation as well as UV radiation, oxygen partial pressure, and air hygiene are not taken into account. The maps constitute a standardized basis for space comparison with respect to efficiency, thermal comfort, and human health.
Author (ESA)

N86-21067 Institute of Balneology and Climatology, Poznani (Poland).
APPLICATION OF METEOROLOGICAL AND SOLAR DATA IN HEALTH RESORT CLIMATHERAPY
S. TYCZKA and I. PONIKOWSKA *In* Deutscher Wetterdienst Annals of Meteorology, No. 22. International Symposium on Human Biometeorology p 140-141 13 Aug. 1985
Avail: Issuing Activity

A quantitative analysis of the thermal and photochemical effects of solar radiation on 150 healthy patients aged 18 to 60 is made to determine the effectiveness of heliotherapy using long-term actinometric data and the intensity of ultraviolet solar radiation corresponding to the Sun exposure time necessary to obtain a skin photoerythema. Global solar radiation is analyzed in relation to the mean photoerythema dose, to the Sun's altitude and to cloudiness. The skin photoerythema dose is the product of solar radiation intensity and Sun exposure time. The results are valid for insolation conditions similar to those on the Baltic coast with solar altitude of 50 to 60 deg. Author (ESA)

N86-21103 New South Wales Univ., Kensington (Australia). Centre for Biomedical Engineering.
ANALYSIS TECHNIQUES FOR CONTINUOUS TWENTY FOUR HOUR AMBULATORY BLOOD PRESSURE PATTERNS Abstract Only
D. J. ROFFE 1985 3 p
Avail: Issuing Activity

The Oxfor ambulatory blood pressure recording system records each arterial blood pressure complex during a 24 hour period onto a miniature cassette tape. A hierarchy of analysis techniques was developed on a DEC LSI-11/03 minicomputer. Subsequent statistical analysis and graphical representation describe the patient's arterial blood pressure variation throughout the recording period. Inspection of 24 hour continuous ambulatory blood pressure record shows many marked, apparently spontaneous blood pressure fluctuations. Detection of these blood pressure transients as they occur may help sort out their causal mechanisms. A microprocessor device was constructed to monitor direct blood pressure in real time and compile a history of the blood pressure and heart rate. E.A.K.

N86-21104 Central Electricity Generating Board, London (England).
THE EFFECT OF EQUALLY EFFECTIVE NEUTRON AND X-RAY RADIATION DOSES ON THE EPITHELIAL CELLS OF THE HAIR BULB
S. M. VALTER, E. L. GINSBURG, A. V. BOGATYREV, G. I. KALONYKOVA, and A. G. SVERDLOV 6 Nov. 1985 13 p refs Transl. into ENGLISH from Radiobiologia (USSR), v. 22, issue 5, 1982 p 637-642
(BLL-CE-TRANS-8221-(9022.090)) Avail: British Library Lending Div., Boston Spa, Engl.

Two stages in the response of rat hair follicle cells to X-ray and neutron irradiation with equally effective doses were examined. Enlargement of endoplasmic reticulum canals, swelling of some of the mitochondria, and appearance of autophagous vacuoles in cells were detected during the first day following irradiation. After 5 to 7 days, the changes which occurred were characteristic of the process of hair follicle transfer from the active to resting stage. No qualitative distinctions are detected in the radiation response of the cells studied. E.A.K.

N86-21105*# Baylor Coll. of Medicine, Houston, Tex. Dept. of Medicine.
IN VIVO NUCLEAR MAGNETIC RESONANCE IMAGING Final Report, Oct. 1984
A. LEBLANC, H. EVANS, R. N. BRYAN, P. JOHNSON, E. SCHONFELD, and S. G. JHINGRAN Oct. 1984 25 p refs
(Contract NAS9-16442)
(NASA-CR-171928; NAS 1.26:171928) Avail: NTIS HC A02/MF A01 CSCL 06P

A number of physiological changes have been demonstrated in bone, muscle and blood after exposure of humans and animals to microgravity. Determining mechanisms and the development of effective countermeasures for long duration space missions is an important NASA goal. The advent of tomographic nuclear magnetic resonance imaging (NMR or MRI) gives NASA a way to greatly extend early studies of this phenomena in ways not previously possible; NMR is also noninvasive and safe. NMR provides both superb anatomical images for volume assessments of individual organs and quantification of chemical/physical changes induced in the examined tissues. The feasibility of NMR as a tool for human physiological research as it is affected by microgravity is demonstrated. The animal studies employed the rear limb suspended rat as a model of mucle atrophy that results from microgravity. And bedrest of normal male subjects was used to simulate the effects of microgravity on bone and muscle. Author

N86-21106*# Nevada Univ., Reno. Fast Motion Perception Lab.
CONTRIBUTIONS TO WORKLOAD OF ROTATIONAL OPTICAL TRANSFORMATIONS Final Technical Report
R. P. ATKINSON and T. L. HARRINGTON 1985 123 p refs
(Contract NCC2-272)
(NASA-CR-176542; NAS 1.26:176542) Avail: NTIS HC A06/MF A01 CSCL 06S

An investigation of visuomotor adaptation to optical rotation and optical inversion was conducted. Experiment 1 examined the visuomotor adaptability of subjects to an optically rotating visual world with a univariate repeated measures design. Experiment 1A tested one major prediction of a model of adaptation put forth by Welch who predicted that the aversive drive state that triggers adaptation would be habituated to fairly rapidly. Experiment 2 was conducted to investigate the role of motor activity in adaptation to optical rotation. Specifically, this experiment contrasted the reafference hypothesis and the proprioceptive change hypothesis. Experiment 3 examined the role of cognition, error-corrective feedback, and proprioceptive and/or reafferent feedback in visuomotor adaptation to optical inversion. Implications for research and implications for practice were suggested for all experiments. Author

N86-21107*# San Francisco State Univ., Calif.
STIMULUS SPECIFICITY AND INDIVIDUAL STEREOTYPY OF AUTONOMIC RESPONSES TO MOTION STRESSORS M.S. Thesis
M. G. MORGAN Aug. 1985 54 p refs
(Contract NCC2-115)
(NASA-CR-176543; NAS 1.26:176543) Avail: NTIS HC A04/MF A01 CSCL 06S

Motion sickness research shows a lack of agreement regarding the contribution of the autonomic nervous system (ANS). The resolution of this question is exigent for Space Adaptation Syndrome, zero gravity sickness. A case is drawn for the necessity to apply a methodological approach that incorporates: (1) standardization of parameters in relation to the individual differences in variability and prestimulus levels; (2) a concern for patterning of responses; and (3) the physiological association with subjective reports. Vasomotor, heart rate, respiration rate, skin conductance and subjective reports of malaise were collected from 22 subjects while participating in three motion stressors; vertical acceleration, Coriolis stimulation, and combined optokinetic and Coriolis stimulation. The results demonstrate that ANS response patterns can be separated into three mutually exclusive components: (1) a generalized response to motion sickness; (2) a stimulus specific response to the type of stressor being presented; and (3) individualized stereotypical response patterns that are associated with subjective reports of malaise. Author

N86-21108*# California Univ., San Francisco. NCC2-115
EXPLORATORY STUDIES OF PHYSIOLOGICAL COMPONENTS OF MOTION SICKNESS: CARDIOPULMONARY DIFFERENCES BETWEEN HIGH AND LOW SUSCEPTIBLES Progress Report
K. NAIFEH 1985 18 p refs
(NASA-CR-176541; NAS 1.26:176541) Avail: NTIS HC A02/MF A01 CSCL 06S

A comprehensive examination of cardiovascular autonomic response to motion sickness was studied and whether differences in cardiopulmonary function exist in high and low susceptibility groups were determined. Measurement techniques were developed as was test equipment for its ability to provide accurately new measures of interest and to test the adequately of these new measures in differentiating between susceptibility groups. It was concluded that these groups can be differentiated using simple, brief stressors and measurements of cardiodynamic function. Author

N86-21109*# California Univ., San Francisco.
SHUTTLE FLIGHT EXPERIMENT 30-DAY SUMMARY REPORT
1985 25 p
(Contract NCC2-115)
(NASA-CR-176539; NAS 1.26:176539) Avail: NTIS HC A02/MF A01 CSCL 06S

A total of 12 AFT training sessions were administered to SL 3 Payload Specialists over a 7 month period. Nine of these sessions were 2 hours in duration and three were 3 hours in duration. A total of three rotating chair tests were conducted in this time frame with four subjects. The performance of these crewmen across tests is shown. Test 1, a baseline motion sickness test, was conducted approximately 10 months prior to the mission, before any AFT was administered. Test 2 was administered after 2 hours of AFT, test 3 after 4 hours and test 4 after 6 hours (total) of training in symptom control. Improvement in performance is reflected by a subject's ability to tolerate a greater number of rotations across tests. Additional training for crewman was not possible within the constraints of the mission. Results of the mission indicate that, as predicted preflight, subject #32 was relatively symptom free inflight while subject #33 was not. Other preflight and postflight tests and analyses are reported. Author

N86-21110# Office of Naval Research, London (England).
THE 10TH MEETING OF THE INTERNATIONAL SOCIETY FOR NEUROCHEMISTRY HELD AT RIVA DEL GARDA, ITALY ON 19-24 MAY 1985
C. E. ZOMZELY-NEURATH 8 Oct. 1985 12 p Meeting held at Riva del Garda, Italy, 19-24 May 1985
(AD-A160668; ONRL-C-10-85) Avail: NTIS HC A02/MF A01 CSCL 06A

The Tenth Meeting of the International Society for Neurochemistry was held in Riva del Garda, Italy, from 19 through 24 May 1985. This report discusses presentations on molecular neurobiology, post-translational modification, neurotransmitter receptors, neuropeptide processing, and specific macromolecules in cell-cell interactions in the nervous system. Author (GRA)

N86-21111# Army Research Inst. of Environmental Medicine, Natick, Mass.
COMPARISON OF MALE AND FEMALE MAXIMUM LIFTING CAPACITY
M. A. TEVES, J. A. VOGEL, and J. E. WRIGHT Sep. 1985 15 p
(AD-A160687; USARIEM-M40/85) Avail: NTIS HC A02/MF A01 CSCL 06S

A large influx of women into traditionally male fields of employment has drawn much attention to the strength differences between men and women. Two tests of isometric strength (handgrip and upright pull) and two tests of maximum lift capacity (a weight lift machine-IDL 152 and a weighted box lift MLC 132) were administered to 90 male and 107 female soldiers at the end of their Basic Training in order to examine differences in female/male (F/M) strength ratio. Skinfold measurements were made to obtain an estimate of lean body mass (LBM). Females exhibited 63% of the isometric strength and 55-59% of the lifting capacity of males. When the scores were normalized for body weight (BW) females were 75% as strong as males on isometric measures, and were able to lift 66% as much on IDL 152 and 72% as much on MLC 132. Comparison of the two lifting tasks revealed that on the average, males were able to lift 18% more weight and 24% more weight on the free lift than on the machine lift. This would suggest that if a machine lift is used for pre-employment screening purposes, the absolute weight an applicant is required to lift on the machine need not equal the maximum weight to be lifted on the job. As the difference between a machine lift and a free lift task was greater in females, a machine lift test may pose a greater disadvantage to female candidates than would isometric or free weight lift testing. GRA

N86-21112# Northwestern Univ., Evanston, Ill. Dept. of Civil Engineering.
HEAD-SPINE STRUCTURE MODELING: ENHANCEMENTS TO SECONDARY LOADING PATH MODEL AND VALIDATION OF HEAD-CERVICAL SPINE MODEL Final Technical Report, May 1980 - May 1984
T. BELYTSCHKO, M. RENCIS, and J. WILLIAMS Jul. 1985 132 p
(Contract F33615-80-C-0523)
(AD-A161425; AAMRL-TR-85-019) Avail: NTIS HC A07/MF A01 CSCL 06S

SAM (for Structural Analysis of Man) is a three-dimensional discrete element mathematical model developed for the prediction of the dynamic response of the head-spine-torso structure to severe impact environments. The model mathematically describes the equations of motion for a system of rigid bodies representing, for example, the head, torso segments and the pelvis, interconnected by deformable elements representing, for example, the intervertebral discs, ligaments and other connective tissues. SAM consists of two distinct components; a general purpose, large displacement, dynamic structural analysis program and a data base containing a number of data sets each which contains material, geometric and inertial property, connectivity and loading environment data. This report describes: the development of a model of the diaphragm which, when incorporated into the HSM, will significantly enhance its ability to replicate the effects of the secondary +Gz loading path through the viscera-abdominal wall/diaphragm/rib-cage system; a discussion of spinal injuries associated with pilot ejection and proposed injury criteria for the cervical spine; an axisymmetric finite element analysis of a lumbar vertebral body with comparisons to other models and specific attention to the question of material distribution effects on stresses; and frontal (-Gx) and lateral (+Gy) impact simulations using the recently developed Head-Cervical Spine Model and comparisons of simulation results with experimental data. GRA

N86-21113# Monsanto Research Corp., Miamisburg, Ohio. Mound.
LIGHT-WEIGHT RADIOISOTOPE HEATER UNIT SAFETY ANALYSIS REPORT (LWRHU-SAR). VOLUME 1. A. INTRODUCTION AND EXECUTIVE SUMMARY. B. REFERENCE DESIGN DOCUMENT (RDD)
E. W. JOHNSON Oct. 1985 96 p
(Contract DE-AC04-76DP-00053)
(DE86-001457; MLM-3293-VOL-1) Avail: NTIS HC A05/MF A01

The orbiter and probe portions of the NASA Galileo spacecraft contain components which require auxiliary heat during the mission. To meet these needs, the Department of Energy's (DOE's) Office of Special Nuclear Projects (OSNP) has sponsored the design, fabrication, and testing of a one-watt encapsulated plutonium dioxide-fueled thermal heater named the Light-Weight Radioisotope Heater Unit (LWRHU). This report addresses the radiological risks which might be encountered by people both at the launch area and worldwide should postulate mission failures or malfunctions occur, which would result in the release of the LWRHUs to the environment. Included are data from the design, mission descriptions, postulated accidents with their consequences, test data, and the derived source terms and personnel exposures for the various events. DOE

N86-21114# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, VOLUME 19, NO. 6, NOVEMBER - DECEMBER 1985
O. G. GAZENKO, ed. 19 Feb. 1986 154 p refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 95 p
(JPRS-USB-86-001) Avail: NTIS HC A08/MF A01

Reports of U.S.S.R. researach in space biology and aerospace medicine are presented. Orthostatic tolerance under various conditions in humans and animals was an important topic of interest. Weightless effects on muscular function in animals and humans were also investigated. Studies were also carried out on the physiological effect of high altitude on the cardiovascular system and the brain.

N86-21115# Joint Publications Research Service, Arlington, Va.
SPATIAL ILLUSIONS OF VESTIBULAR GENESIS DURING FLIGHTS IN AIRCRAFT
E. V. LAPAYEV and O. A. VORCBYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 11-16 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 11-15
Avail: NTIS HC A08/MF A01

Vestibular illusions (incidence, pattern, manifestation, negative effect on pilot's activity) that occur in the atmospheric flight were studied. A special questionnaire was used to interview anonymously 484 flying crewmembers. Spatial illusions were detected in 71.1% of the crewmembers; they developed in 50.6% when turns were performed and they were perceived in 76.2% as a false bank. Over 50% (54.3%) of the crewmembers interviewed reported that spatial illusions adversely affected pilot's performance and 3.6% of them indicated that they adversely influenced the flight program as a whole. Spatial illusions can be generated by various factors which should be taken into account in order to improve countermeasures against spatial illusions in the flying personnel.
Author

N86-21116# Joint Publications Research Service, Arlington, Va.
VESTIBULAR FUNCTION IN OLDER INDIVIDUALS SUBMITTED TO ANTIORTHOSTATIC HYPOKINESIA FOR 30 DAYS
V. K. GAVRILIN and L. N. ZAKHAROVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 17-25 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 15-20
Avail: NTIS HC A08/MF A01

Vestibular responses of 15 men (aged 42 to 50) to 30-day head-down tilt (-8 deg) were investigated. The test subjects showed atherosclerotic symptoms and neurocirculatory dystonia of the hypertensive type. They were exposed to the Fitzgerald-Hallpike caloric test, indirect otolithometry (eye counter-rolling reflex according to the method of successively presented images), and motion sickness according to Bryanov. In the pretest period vestibular changes were seen at the level of labyrinths and central formations (change in the nystagmic pattern, dissociation of the components of the caloric reaction, vestibular asymmetry, negative counter-rolling). During head-down tilt cupular reflexes remained essentially unaltered, except for the asymmetry and enhancement of the sensory and autonomic components of the caloric reaction. The otolith function was modified in all the test subjects. After exposure tolerance to motion sickness was not deteriorated.
Author

N86-21117# Joint Publications Research Service, Arlington, Va.
CHARACTERISTICS OF ACCELERATIONS IN AEROBATIC FLIGHT AS A SPORT
V. G. VOLOSHIN, Y. I. BYKOVA, A. V. OPRYSHKO, and N. A. LAPSHINA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 26-28 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 20-22
Avail: NTIS HC A08/MF A01

Thirty well-qualified flying sportsmen, aged 22 to 42, who performed 210 aerobatic flights, onboard a sporting airplane Yak-50, were examined, using an automatic monitoring system. The flyers were exposed to +9 Gz and -6 Gz as a maximum the duration of which was 10 s and 5 s, respectively. The onset rate varied from 0.5 to 2.5 G/s (with the mean rate 1 G/s), reaching 4.2 G/s as a maximum. On the average, the training flight lasts 25 min, 45 to 50% of which the pilot experiences acceleration of

various values and different sign. The most common acceleration values are: +6 and +7 Gz or -4 and -5 Gz. Author

N86-21118# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS IN REACTIONS TO ACTIVE ORTHOSTATIC AND WATER-LOADING TESTS OF SUBJECTS DIFFERING IN TOLERANCE TO POSITIVE GZ ACCELERATIONS
I. G. DLUSSKAYA and M. N. KHOMENKO *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 29-35 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 22-27
Avail: NTIS HC A08/MF A01

Thirty-seven healthy male test subjects, aged 19 to 21, with different +Gz acceleration tolerance were examined. Their blood pressure (BP) and heart rate (HR) during 5-min tilt tests and 2% water loading tests were measured 2 to 3 weeks prior to centrifugation. Quantitative evaluation of orthostatic tolerance using an orthostatic index and BP and HR responses to tilt tests before and after water loading revealed specific features of cardiovascular regulation in the subjects with high and low +G acceleration tolerance. The negative predictive indicators include: decreased BP, HR and cardiac index in the supine position in combination with high orthostatic tolerance, as well as decreased orthostatic tolerance in combination with a lower function of vasoconstrictor mechanisms in the upright position and a lower sensitivity of carotid sinus reflexes to blood volume changes during tilt and water loading tests. Author

N86-21119# Joint Publications Research Service, Arlington, Va.
EFFECT OF IMMERSION HYPOKINESIA ON CHARACTERISTICS OF PROGRAMMED VOLUNTARY MOVEMENTS
A. V. KIRENSKAYA, I. B. KOZLOVSKAYA, and M. G. SIROTA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 36-43 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 27-32
Avail: NTIS HC A08/MF A01

The effect of immersion hypokinesia on the precision of program-type voluntary movements was investigated using standard test movements and quanitative analytical methods. The exposure did not cause disorders in the programme mechanisms but reduced significantly the precision range of the motor control system. The loss of precision was at its maximum (by 100% and over) on immersion day 3. The universality and consistency of the above changes indicated their close association with the specific exposure while the fast rate of their development suggested their reflex nature. Author 10;m K;m K

N86-21120# Joint Publications Research Service, Arlington, Va.
CEREBRAL CIRCULATION AND OXYGENATION IN HEALTHY MAN DURING GRADED EXERCISE IN ANTIORTHOSTATIC POSITION
V. Y. KATKOV and N. V. PRAVETSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 44-47 19 Feb. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 32-34
Avail: NTIS HC A08/MF A01

Eleven healthy male test subjects performed exercises of 600 kgm/min (98 W) for 20 min in the head-down position (-15 deg). A day before exercises they were catheterized, with catheters implanted into the internal jugular vein and brachial artery. It was shown that exercises in the head-down position an increase in cerebral circulation, a decrease in oxygen utilization and a decrease in jugular pressure. CO2 tension in arterial blood and blood outflowing from the brain remained comparatively stable, while base deficiency and buffer capacity decreased by a similar value. Author

N86-21121# Joint Publications Research Service, Arlington, Va.
FORCED EXPIRATION PARAMETERS IN HEALTHY MAN SUBMITTED TO SIMULATED WEIGHTLESSNESS
N. M. ASYAMOLOVA, V. G. SHABELNIKOV, V. M. BARANOV, A. N. KOTOV, and M. Y. VOLKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 48-52 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 34-37
Avail: NTIS HC A08/MF A01

Lung volumes and forced expiratory volumes during 3-hour water immersion as well as in the upright and supine positions were measured. Water immersion up to the neck decreased the functional residual capacity, peak and maximum velocities of air flows during inspiration and expiration with various lung volumes and increased the forced expiratory time and pulmonary time constant. These changes seem to be produced by a higher inelastic resistance as well as additional hydrostatic pressure upon the chest and abdomen. During the transfer from the upright to the supine position these changes were identical but of smaller magnitude. Author

N86-21122# Joint Publications Research Service, Arlington, Va.
EFFECT OF RESTRICTED MOTOR ACTIVITY ON ALANINE LEVEL IN HUMAN PLASMA
T. F. VLASOVA, Y. B. MIROSHNIKOVA, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 53-57 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 37-40
Avail: NTIS HC A08/MF A01

The plasma alanine concentration was measured in 28 healthy male test subjects exposed to head-down tilt of various duration (2-hour exposure at -12 deg, 7-day exposure at -6 deg, 49-day exposure at -4 deg, and 120-day exposure at -4 deg). Head-down tilt led to alanine changes that correlated with exposure time. These results suggest that alanine concentrations in blood reflect to a certain extent the rate of hepatic gluconeogenesis and depend significantly on the hypokinetic time. The findings can be clinically used as a measure of hepatic gluconeogenesis in bed-ridden patients that may require preventive or therapeutic treatment. Author

N86-21123# Joint Publications Research Service, Arlington, Va.
EFFECT OF WEIGHTLESSNESS AND SOME OF ITS MODELS ON MECHANICAL PROPERTIES OF ANIMAL BONES SUBMITTED TO TORSION
M. A. DOBELIS, Y. Z. SAULGOZIS, V. Y. NOVIKOV, Y. A. ILIN, and V. S. OGANOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 58-65 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 40-45
Avail: NTIS HC A08/MF A01

Mechanical properties (stress and strain) of bones from rats of different ages exposed to weightlessness, hypodynamia or hypokinesia were examined upon torsion. As compared to the controls, the femur of Cosmos-1129 rats showed high deformability. Also, skeletal bones of young rats proved more sensitive to hypodynamia than those of adult animals. Author

N86-21124# Joint Publications Research Service, Arlington, Va.
ROLE OF VITAMIN D3 ACTIVE METABOLITES IN REGULATION OF CALCIUM METABOLISM IN HYPOKINETIC RATS
I. N. SERGEYEV, B. V. AFONIN, N. V. BLAZHEYEVICH, B. V. MORUKOV, and M. S. BELAKOVSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 66-71 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 46-50
Avail: NTIS HC A08/MF A01

The rats exposed to prolonged hypokinesia showed hypocalcemia, lower PTH and higher calcitonin concentrations in the serum, decreased calcium absorption in the small intestine, and a trend toward nephro- and arteriocalcinosia. Prophylactic administration of 24,25-hydroxy D sub 3, 1,25-hydroxy D sub 3 and their combinations enhanced calcium absorption and alleviated hypocalcemia. The changes in the hormonal regulation of calcium homeostasis can be viewed as a factor responsible for calcium metabolic disorders associated with hypokinesia. Author

N86-21125# Joint Publications Research Service, Arlington, Va.
COMPARISON OF BONE REACTIONS OF RATS SUBMITTED TO CLINOSTATIC AND ANTIORTHOSTATIC HYPOKINESIA
V. N. SHVETS, A. S. PANKOVA, O. Y. KABITSKAYA, and Z. Y. VNUKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 72-78 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 50-54
Avail: NTIS HC A08/MF A01

Examination of spongy bones of rats exposed to clino- and antiorthostatic hypokinesia showed that changes in bone mass, bone cells and their precursors were similar in both cases. The bone resorption-bone formation process remained balanced. However, bone responses to clino- and antiorthostatic hypokinesia exhibited certain differences. Clinostatic hypokinesia produced greater osteo-porosis in the femoral bone, whereas bone losses in the humerus, sternum and pelvis were identical. Antiorthostatic hypokinesia led to osteoporosis that was identical in every bone examined. In addition, clino- and antiorthostatic hypokinesia caused different reactions of stromal precursor cells, the latter model producing a greater effect on them. It is concluded that immobilization-induced skeletal disorders are associated with a decreased rate of bone histogenesis which proceeds at a lower level rather than with the stress-reaction. Author

N86-21126# Joint Publications Research Service, Arlington, Va.
CONDITION OF THYROID GLAND AND C CELLS DURING LONG-TERM ROTATION (MORPHOLOGICAL AND BIOCHEMICAL INVESTIGATION)
G. I. PLAKHUTA-PLAKUTINA, Y. A. SAVINA, and B. V. AFONIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 79-83 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 54-57
Avail: NTIS HC A08/MF A01

The thyroid and parathyroid glands of 65 Wistar rats centrifuged for 30 days at 1.1 and 2.0 G were examined histologically and biochemically. The centrifugation led to a higher activity to C cells, an increased rate of thyro-calcitonin (TCT) synthesis and excretion, i.e., C-cell degranulation, and a significant (twofold) increase of TCT in plasma. The stimulation effect of the TCT-producing system persisted during 7-postrotation days and was very distinct in the animals exposed to 2.0 G. There were no morphological changes in the parathyroid glands or in the PTH concentration in the plasma. Author

N86-21127# Joint Publications Research Service, Arlington, Va.
CONDITION OF CARDIOVASCULAR SYSTEM IN PRESENCE OF ACUTE MOUNTAIN SICKNESS
M. M. MIRRAKHIMOV, R. O. KHAMZAMULIN, and V. A. LARKOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 84-90 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 57-62
Avail: NTIS HC A08/MF A01

Fifteen subjects with uneventful adaptation and 28 subjects with acute high mountain sickness were kept at an altitude of 3600 m. Prior to the exposure all the test subjects, aged 18 to 20, were essentially healthy. As compared to the controls, the subjects with acute high mountain sickness showed a greater increment in heart rate, blood pressure in the brachial artery, pulmonary hypertension and vasoconstriction. It was found that the subjects susceptible to acute high mountain sickness exhibited (at sea level) higher values of heart rate and R wave in the ECG II lead and lower systolic pressure in the brachial artery. These findings can serve as predictors of acute high mountain sickness. Author

N86-21128# Joint Publications Research Service, Arlington, Va.
RAT BRAIN IMPEDANCE IN STATIONARY MAGNETIC FIELD
L. D. KLIMOVSKAYA, N. P. SMIRNOVA, and A. S. DYAKONOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 91-94 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 62-64
Avail: NTIS HC A08/MF A01

The cortical impedance of the large hemispheres of nembutal-anesthetized rats exposed to a constant magnetic field of 0.1, 0.4 and 1.6 T was investigated. During 20 min. exposure the impedance decreased (at the expense of a decrease in both of its components--capacity and active resistance). The impedance decrease was more pronounced (up to 93%) and statistically significant in a field of 1.6 T. After exposure the impedance decrease persisted for 10 min. Author

N86-21129# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL ARRHYTHMIA AND ITS PREVENTION
L. L. STAZHADZE, T. A. VENTSLAVSKAYA, and V. V. KORZHOVA *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 95-101 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 64-68
Avail: NTIS HC A08/MF A01

The preventive antiarrhythmic effect of a new derivative of selene-containing aralkyl amines, i.e., selenophene-24, was compared with the routinely used drugs--novocain amide, isoptin and inderal. With respect to the preventive effect and spectrum of action selenophene-24 was shown to be advantageous on various experimental models of arrhythmias: aconitium, strophantinum, pituitrinum or calcium chloride. Author

N86-21130# Joint Publications Research Service, Arlington, Va.
EVALUATION OF CONDITION OF HUMAN SKIN IN A CLOSED ENVIRONMENT BY MEANS OF CHROMATOGRAPHY
D. M. DUBININ, V. P. NAYDINA, and S. N. ZALOGUYEV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 102-108 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 69-73
Avail: NTIS HC A08/MF A01

Gas-liquid chromatography was used to study the skin and sebum cutaneum of 6 male test subjects (aged 45 to 55) before and after 30-day enclosure. The greatest changes were seen in the composition of free fatty acids of lipids of the facial skin

(increase of palmito-oleic acid). The lipid composition of the sebum cutaneum of the healthy subjects differed from that of the acne-bearing subjects. It is recommended to use the ratio of palmitic acid to palmito-oleic acid as a measure of changes of fatty acids in the sebum cutaneum of healthy people in an unusual environment. Author

N86-21131# Joint Publications Research Service, Arlington, Va.
TOXICOLOGICAL EVALUATION OF GAS EMISSION FROM HEAT-STABLE TETRAFLUOROETHYLENE-BASED POLYMERS WHEN HEATED
V. F. USHAKOV, G. I. SOLOMIN, G. P. TIKHONOVA, A. I. GORSHUNOVA, I. I. LYUBARSKAYA, L. V. MARCHENKO, E. I. CHUKHNO, N. Y. OSTASHEVA, Y. A. DEMCHENKO, and S. S. PASHIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 109-114 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 73-77
Avail: NTIS HC A08/MF A01

The purpose of this study was to investigate the composition and toxicity of fluoroplastic F-40 thermodestruction products at 300 to 500 C and to identify the maximally allowable temperature for their safe use. When heated over 400 C, the products of fluoroplastic F-40 evolution included such compounds as hydrogen fluoride, fluoroorganic compounds, carbon monoxide, formaldehyde. When heated at 500 C, the thermodestruction products caused the highest mortality rate of mice. The pathogenesis and clinical development of fluoroplastic F-40 poisoning are primarily associated with fluoro-compounds. It is concluded that the temperature 300 C is the maximum temperature at which tetrafluoroethylenebased polymers can be used. Author

N86-21133# Joint Publications Research Service, Arlington, Va.
DEVICE FOR COMBINED STUDY OF VISUAL TRACKING AND VERBAL ACTIVITY
B. A. KARPOV and A. I. PUDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 120-123 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 80-82
Avail: NTIS HC A08/MF A01

The diverse forms of industrial and research work often require that man combine intensive visual tracking with verbal activity. A pilot or cosmonaut may be compelled to keep attentive watch over relatively mobile reference points, targets and other objects and, at the same time, hold responsible conversations, receive or give orders, receive important information orally, etc. It is necessary to make synchronous records of the subject's eye movements, his speech as well as speech addressed to him for a quantitative evaluation of tracking distinctions associated with a verbal load. An experimental device designed to solve this problem should meet the following conditions: (1) eye movements must be recorded by a rather sensitive method, so that all elements of functional significance to tracking of eye movements in the macro- and microrange (with the exception of tremor) are distinctly recorded, (2) the test signals delivered for tracking must be few in number and standard, typical, and (3) the tracing obtained as a result of the examination must provide a clear idea about the oculomotor and verbal activity of the subject, as well as the speech of individuals with whom he converses. A device for simultaneous and combined recording of two processes in graphic form--eye movements when tracking visual stimuli and concomitant conversation is described. B.W.

N86-21135# Joint Publications Research Service, Arlington, Va.
EFFECT OF ACTIVE ANTIORTHOSTATIC CONDITIONING ON TOLERANCE TO CRANIAL REDISTRIBUTION OF BLOOD
A. F. ZAVADOVSKIY, M. M. KOROTAYEV, S. V. KOPANEV, I. A. PLYASOVA-BAKUNINA, and Y. N. VAVAKIN *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 126-129 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 83-85
Avail: NTIS HC A08/MF A01

At the present time, antiorthostatic position of the body is used extensively in aerospace medicine as a model for investigation of reactions of the cardiovascular system to gravity-caused redistribution of blood. In particular, one can predict, to some extent, tolerance of the circulatory system to weightlessness, particularly in the acute period of adaptation, by means of the antiorthostatic test an angles of -15 and -30 deg. A distinction is made between active and passive orthostatic tests. In the active form, the subject assumes an antiorthostatic position by himself and voluntary muscular tension is mandatory; in the passive form, the position is usually obtained by means of a turntable. Under these conditions one observes muscular relaxation. The objective here was to investigate the flexibility of regulatory mechanisms of the cardiovascular system and the possibility of enhancing the body's tolerance to gravity-related redistribution of blood by using active antiorthostatic tests. Author

N86-21136# Joint Publications Research Service, Arlington, Va.
SOME ASPECTS OF HUMAN AMINO ACID METABOLISM AT HIGH ALTITUDE
Y. A. SINYAVSKIY, T. F. VLASOVA, M. S. BELAKOVSKIY, Y. A. SENKEVICH, and B. I. KIM *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 130-133 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 85-87
Avail: NTIS HC A08/MF A01

The problem of adaptation to altitude hypoxia has become particularly timely recently in view of the active economic development of mountainous regions and the need to perform difficult forms of physical and intellectual work at high altitudes. In addition, high-altitude climate is used extensively for prevention and treatment of cardiovascular and pulmonary pathology, as well as for holding training meets for representatives of different sports. But stays at high altitudes and concomitant hypoxial lead to functional changes in different systems of the body, eliciting changes in energy, protein and amino acid metabolism, yet the latter has not been sufficiently investigated. This study was undertaken in order to assess amino acid metabolism as related to hypoxic conditions and physical exercise in top-ranking sport mountain climbers, who were candidates for an expedition to Mount Everest, at the time of their adaptation to high-altitude conditions and after an ascent to more than 4000 m above sea level.
Author

N86-21137# Joint Publications Research Service, Arlington, Va.
ELECTROCARDIOGRAM IN NEHB TYPE LEADS OF MACACA MULATTA MONKEYS
V. P. MELNICHENKO, M. D. GOLDOVSKAYA, I. O. GIRYAYEVA, Y. V. SHEVCHENKO, G. G. CHAMURLIYEV, and V. S. MAGEDOV *In its* USSR Report: Space Biology and Aerospace Medicine, Volume 19, no. 6, November - December 1985 (JPRS-USB-86-001) p 134-138 19 Feb. 1986 refs Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 19, no. 6, Nov. - Dec. 1985 p 87-89
Avail: NTIS HC A08/MF A01

Macaca mulatta (rhesus) monkeys are used extensively in model experiments, which reproduce various physiological and pathological states, including cardiovascular diseases 6. There are a considerable number of publications dealing with the normal

electrocardiogram (ECG) of lower primates, including Macaca mulatta, which were recorded in standard and amplified monopolar leads from the extremities. At the same time, when monitoring the heart's bioelectric activity in chronic experiments there are some advantages to using the system of bipolar precardiac leads of Nehb, since it permits recording the ECG when there is a high signal level in several projection planes of the resultant vector of the heart's electromotive force with a minimum of implanted exploring electrodes. However, there is no information in the literature concerning the standard features of the ECG in the Nehb leads for monkeys. The objective here was to examine the ECG distinctions of monkeys as recorded in the leads of Nehb using chronically implanted electrodes. Author

N86-22093* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 282)
Mar. 1986 67 p
(NASA-SP-7011(282); NAS 1.21:7011(282)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 154 reports, articles, and other documents introduced into the NASA scientific and technical information system in February 1986. Author

N86-22094*# National Aeronautics and Space Administration, Washington, D.C.
THE HISTORY OF AERONAUTICAL MEDICINE IN VENEZUELA
D. R. IRIARTE Feb. 1986 20 p Transl. into ENGLISH of "Historia de la Medicina Aeronautica en Venezuela" presented at the 6th Seminar of Aeronautical Medicine, 1985 p 1-15 Seminar held in Caracas, Venezuela, 27-28 Sep. 1985 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASW-4005)
(NASA-TM-77709; NAS 1.15:77709) Avail: NTIS HC A02/MF A01 CSCL 06E

The Aerial Medical Service of the Ministry of Transportation and Communications of Venezuela was created on June 1949, and later became the Department of Aeronautical Medicine. Its functions include the medical examinations of future pilots, navigators and flight engineers. The importance of good mental and physical health in all flight and ground personnel to ensure the safety of air travel is discussed. Author

N86-22095*# Hershey (Milton S.) Medical Center, Hershey, Pa. Div. of Gastroenterology.
VECTION-INDUCED GASTRIC DYSRHYTHMIAS AND MOTION SICKNESS Annual Report, 1 May 1985 - 30 Apr. 1986
K. L. KOCH and R. M. STERN 1 Apr. 1986 64 p refs
(Contract NAG9-118)
(NASA-CR-176620; NAS 1.26:176620; AR-1) Avail: NTIS HC A04/MF A01 CSCL 06S

Gastric electrical and mechanical activity during vection-induced motion sickness was investigated. The contractile events of the antrum and gastric myoelectric activity in healthy subjects exposed to vection were measured simultaneously. Symptomatic and myoelectric responses of subjects with vagotomy and gastric resections during vection stimuli were determined. And laboratory based computer systems for analysis of the myoelectric signal were developed. Gastric myoelectric activity was recorded from cutaneous electrodes, i.e., electrogastrograms (EGGs), and antral contractions were measured with intraluminal pressure transducers. Vection was induced by a rotating drum. gastric electromechanical activity was recorded during three periods: 15 min baseline, 15 min drum rotation (vection), and 15 to 30 min recovery. Preliminary results showed that catecholamine responses in nauseated versus symptom-free subjects were divergent and pretreatment with metoclopramide HC1 (Reglan) prevented vection-induced nausea and reduced tachygastrias in two previously symptomatic subjects. Author

N86-22096# National Aerospace Lab., Tokyo (Japan).
ELECTRODERMAL CHANGES CORRESPONDING TO THE DEGREE OF DISCOMFORT INDUCED BY MOTION SICKNESS
1985 19 p refs In JAPANESE; ENGLISH summary
(NAL-TR-880; ISSN-0389-4010) Avail: NTIS HC A02/MF A01

The qualitative correspondence between the degree of discomfort induced by motion sickness and the following electrodermal changes was examined; skin potential level (SPL), skin resistance level (SRL), and skin potential reflex (SPR). A depolarizing change in SPL and a lowering of SRL were observed which corresponded to lasting discomfort. These changes were detected in the thermal sweat areas. It was suggested that the change in SPL also occured in the arousal sweat area. Arousal response appears in the arousal sweet area rather than in the sweat areas. SPL showed better correspondence than SRL, especially in the time required for recovery after the discomfort stimulation. On the other hand, SPR was observed in the arousal sweat area accompanied by transient discomfort induced by Corioils stimulus. It was indicated that the amplitude of the positive wave (P wave) in SPR might correlate quantitatively to the degree of discomfort. SPR was not remarkably detected in the thermal sweat areas. Author

N86-22097# California Univ., Irvine, Dayton, Ohio.
TOXIC HAZARDS RESEARCH UNIT ANNUAL TECHNICAL REPORT: 1985 Report, Jun. 1984 - May 1985
J. D. MACEWEN and E. H. VERNOT Sep. 1985 202 p
(Contract F33615-80-C-0512)
(AD-A161558; AAMRL-TR-85-058; REPT-22) Avail: NTIS HC A10/MF A01 CSCL 06T

The research program of the Toxic Hazards Research Unit (THRU) for the period of June 1984 through May 1985 is reviewed in this report. Chronic toxicity and oncogenic studies were carried out with hydrazine, JP-4, and JP-8. Results of histopathologic examination became available for a number of studies including chronic inhalation exposures to monomethylhydrazine, methylcyclohexane, and Otto Fuel II; and subchronic to petroleum and oil shale diesel fuel marine. These studies are now complete. Other investigations are complete except for histopathologic results. These include chronic exposures to petroleum JP-4, RJ-5, JP-7, JP-TS, and JP-10; subchronic exposures to petroleum JP-4 and JP-8; and weekly exposures to hydrazine. Three studies have concluded the exposure phases and are now being held postexposure - 90 day continuous exposures to shale JP-4 and dimethyl methylphosphonate and rat strain susceptibility to shale JP-4. A series of short-term toxicity studies was conducted on a variety of chemicals and chemical agents used by the Army, Air Force, and Navy. GRA

N86-22098# Naval Health Research Center, San Diego, Calif.
MECHANISMS OF BIOENERGETIC HOMEOSTASIS DURING EXERCISE: A GENERAL MODEL Interim Report
C. G. GRAY May 1985 27 p
(Contract MR0-00001)
(AD-A161678; NAVHLTHRSCHC-85-19) Avail: NTIS HC A03/MF A01 CSCL 06P

Studies over the past several years have identified limitations of substrate utilization as a primary determinant of physical endurance capacity. These studies have shown that muscles have a preference and a great capacity to utilize fats as a source of energy. However, the prepoderance of these studies have been directed at extending endurance by increasing glucose availability through increasing muscle glycogen stores or supplementing endogenous glucose supplies during exercise with various forms of sugar containing solutions. Some studies have shown that oral administration of glucose solutions during exercise can improve performance, while prefeeding with glucose decreases endurance performance. However, physical training and adaption to low carbohydrate diets drive the system toward greater fatty acid oxidation during exercise. The main problem appears to be integration of the observed effects of training and dietary manipulation into a comprehensive solution for maximizing physical endurance under a variety of circumstances. This report presents

a brief review of information of the mechanisms which regulate cellular substrate metabolism in the central nervous system, liver, muscles, and adipose tissue. The concepts are organized into a systematic metabolic model which interlaces the mechanisms at work within each subsystem. Examples of regulation of substrate flows is presented for exercise under three conditions: fasted, post-prandial, and after adaptation to a low carbohydrate diet. By using the proposed scheme of integrative metabolism, complex dietary and physical training programs for extending endurance performance are suggested. GRA

N86-22099# Thermedics, Inc., Woburn, Mass.
DEVELOPMENT OF AN ULTRAFAST-CURING WOUND DRESSING Annual Report, 30 Sep. 1983 - 30 Sep. 1984
M. SZYCHER and J. L. ROLFE 15 Mar. 1985 31 p
(Contract DAMD17-83-C-3240; DA PROJ. 3S1-62775-A-825)
(AD-A162471; TE4337-53-85) Avail: NTIS HC A03/MF A01 CSCL 06L

This document describes a second-generation, drug-dispensing wound dressing. The wound dressing, which can be applied by the wounded soldier himself, incorporates thrombin as a coagulant to stop bleeding, and gentamycin sulfate as a wide-spectrum antibiotic to prevent bacterial infection. The new would dressing is a trilaminate composite. The air side of the trilaminate is a fabric impregnated with an aliphatic, medical grade polyurethane elastomer; the middle laminate is a controlled release layer, containing the microencapsulated pharmacoactive agents, and the third laminate is a 1.0-mil-thick layer of acrylic-based, pressure-sensitive adhesive. The middle layer is fabricated from a mixture of urethane and silicone oligomers, which are precompounded with pharmacoactive agents, and is subsequently solidified (cured) upon mere exposure to low-intensity UV radiation at room temperature. Solidification at room temperature is a vital consideration, because most drugs are rapidly inactivated upon mild heating. Once cured, the oligomer layer containing pharmacoactive agents becomes a controlled-release monolith, capable of dispensing drugs at a continuous and predictable rate. GRA

N86-22100# Iowa Univ., Iowa City. Coll. of Medicine.
THE ROLE OF ENDORPHINS IN THE PATHOPHYSIOLOGY OF HEMORRHAGIC AND ENDOTOXIC SHOCK IN THE SUBHUMAN PRIMATE Annual Report, 1 Jun. 1980 - 31 May 1981 and Final Report, 15 Sep. 1981 - 15 Mar. 1985
N. J. GURLL, D. G. REYNOLDS, T. VARGISH, and C. V. GISOLFI 15 Mar. 1985 65 p
(Contract DAMD17-80-C-0094; DAMD17-81-C-1177; DA PROJ. 3S1-62772-A-874)
(AD-A162483) Avail: NTIS HC A04/MF A01 CSCL 06O

In order to investigate the pathophysiological role of endogenous morphine-like substances (endorphins) in shock, we studied cynomolgus monkeys and dogs subjected to hemorrhagic or endotoxic shock. Blockade of opiate receptors with naloxone improved cardiovascular function and survival in both species and both models but requires correction of acidosis and hypothermia. Shock is associated with elevations in plasma levels of endorphins. Using different sites of injection and various anatomical and pharmacological ablations, we have shown that naloxone's beneficial effects in hemorrhagic shock are due to potentiation of the effect of released catecholamines on cardiac opiate receptors. The myocardial depression found in shock is due to an endorphin-mediated attenuation of catecholamine activity on the heart. We believe this is mediated by interaction with cardiac receptors and is expressed via G-protein activation of adenylate cyclase and cyclic-AMP. This hypothesis needs to be tested by biochemical determination of these substances, and our observations need to be extended to endotoxic shock. Nevertheless, naloxone and other antiendorphin substances may be important in the treatment of shock by reversing one of the important pathophysiological mechanisms of cardiovascular depression. GRA

N86-22101# Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineering.
INCORPORATION OF ACTIVE ELEMENTS INTO THE ARTICULATED TOTAL BODY MODEL Final Report, 26 Sep. 1983 - 30 Jun. 1985
A. FREIVALDS 30 Jun. 1985 113 p
(Contract F33615-83-C-0506)
(AD-A162518; AAMRL-TR-85-061) Avail: NTIS HC A06/MF A01 CSCL 06P

The Articulated Total Body (ATB) Model, based on rigid-body dynamics with Euler equations of motion and Lagrange type constraints, is used by the Harry G. Armstrong Aerospace Medical Research Laboratory to predict the forces and motions experienced by air crew personnel in typical flight operations. To provide a more realistic representation of human dynamics, active neuromusculature was added to the ATB Model using elements of the newly developed advanced harness system. A lumped three-parameter muscle model with a contractile element, a damping element and a parallel elastic element was developed. The contractile element included a length-tension relationship, a force-velocity relationship and an active state function. The basic fiber mechanisms were integrated into muscle systems utilizing motor unit organization, orderly recruitment of motor units and adjustments in force due to fatigue and reflex action. The complete muscle systems were then used to replicate the human neuromusculature of the trunk and neck and for the elbow, shoulder, hip and knee joints. GRA

N86-22102# Army Research Inst. of Environmental Medicine, Natick, Mass.
HEAT ACCLIMATIZATION DEVELOPED DURING SUMMER RUNNING IN NORTHEASTERN UNITED STATES
L. E. ARMSTRONG, R. W. HUBBARD, J. P. DELUCA, and E. L. CHRISTENSEN Dec. 1985 27 p
(Contract DA PROJ. 3E1-62777-A-879)
(AD-A162728) Avail: NTIS HC A03/MF A01 CSCL 06P

Five highly trained distance runners (DR) were observed during controlled 90-min thermoregulation trials in spring and late summer to document the extent of heat acclimatization developed during summer running in Northeastern United States. These trials simulated environmental and exercise stresses encountered by DR during daily training. Between spring and late summer, DR trained outdoors for weeks but consequently showed few physiological adaptations classically associated with HA. Statistical comparison indicated no significant differences in mean heart rate, rectal temperature, sweat, plasma, or change in plasma, volume during exercise; mean weighted skin temperature was unchanged (except at 50 min of exercise) and sweat rate was also unchanged (except during the initial 30 min segments). Significant decreases in submaximal oxygen uptake were observed, at treadmill speeds of 80, 120, and 200 m min respectively. It is conclude that distance runners did not require summer heat exposure to adequately thermoregulate during the spring trial, which simulated the hottest summer days recorded during this study. GRA

N86-22103# California Univ., San Diego, La Jolla.
ADVANCED CLINICAL RESEARCH IN SHOCK AND TRAUMA Final Report, 1976 - Feb 1985
R. M. PETERS Feb. 1985 6 p
(Contract N00014-76-C-0282)
(AD-A162730) Avail: NTIS HC A02/MF A01 CSCL 06E

This final report covers the years from 1976 through February, 1985. The overall subject of this research has been the best methods of resuscitation and maintaining patients who have hypovolemic shock of major surgery, particularly the support of the cardiac and the respiratory function. The number of subjects covered is described with the years in which those projects were completed and their conclusion. Table I lists the publications that have resulted from these investigations. GRA

N86-22104# Army Research Inst. of Environmental Medicine, Natick, Mass.
AN AUTOMATED SYSTEM FOR COMPREHENSIVE ASSESSMENT OF VISUAL FIELD SENSITIVITY
J. L. KOBRICK, A. R. LUSSIER, S. MULLEN, and C. WITT Apr. 1985 19 p
(AD-A162755; USARIEM-T10/85) Avail: NTIS HC A02/MF A01 CSCL 06P

A device for comprehensive assessment of the capability of operators for detection and location of visual signals throughout the functional visual field is described. The system is completely automated and computerized, and provides documentation files and graphic descriptions of each operator performance immediately upon completion of testing. Sensitivity can be measured for three stimulus colors (red, yellow, green), in a testing situation which mimics commonplace viewing. An abbreviated listing of the main operating program software is provided. GRA

N86-22105# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
MODELING ELECTROCARDIOGRAMS USING INTERACTING MARKOV CHAINS
P. C. DOERSCHUK, R. R. TENNEY, and A. S. WILLSKY Jul. 1985 64 p
(Contract AF-AFOSR-0258-82)
(AD-A162758; LIDS-P-1491; AFOSR-85-1118TR) Avail: NTIS HC A04/MF A01 CSCL 06E

A methodology for the statistical modeling of cardiac behavior and electrocardiograms (ECG's) is developed that emphasizes a) the physiological event/detailed waveform hierarchy; and b) the importance of control and timing in describing the interactions among the several anatomical subunits of the heat. This methodology has been motivated by a desire to develop improved algorithms for statistical rhythm analysis that capture cardiac behavior in a more fundamental way but that stops short of complete accuracy in order to highlight decompositions that can be exploited to simplify statistical inference based on these models. The models consist of interacting finite-state processes, where a very few of the transition probabilities for each process can take on a small number of different values depending upon the states of neighboring processes. Each finite-state process is constructed from a very small set of elementary structural elements. The methodology is illustrated by describing models for three cardiac rhythms and include simulation results for one of these, namely the rhythm known as Wenckebach. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-28435
AXIOMATIC AND NUMERIC CONJOINT MEASUREMENT - A COMPARISON OF THREE METHODS FOR OBTAINING SUBJECTIVE WORKLOAD (SWAT) RANKINGS
T. E. NYGREN (Ohio State University, Columbus) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 878-883. refs

A study comparing three different conjoint scaling data collection methods was done using CMSCAL, the general axiomatic and numerical conjoint measurement algorithms underlying the Subjective Workload Assessment Technique (SWAT). Subjects rank ordered stimulus combinations from a 3 x 3 x 3 factorial design. They did this twice, once as either (1) a full sort of all 27 combinations, or as (2) a partial half set, consisting of a subset of 15 of the 27 stimulus combinations, or (3) as tradeoff combinations of pairs of the three factors. For each of 84 subjects, a CMSCAL conjoint scaling analysis was done on both of their data sets. When the three procedures were compared, the half set method produced significantly better additive solutions than did the full sorting method. Implications of these findings for the applied researcher are discussed. Author

A86-28450#
THE DISSOCIATION BETWEEN SUBJECTIVE AND PERFORMANCE-BASED MEASURES OF OPERATOR WORKLOAD
W. L. DERRICK (U.S. Air Force Academy, Colorado Springs, CO) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 1020-1025. refs

A study is reported of workload dissociation, in which different estimates of workload are obtained for the same task performed by the same people according to whether system performance data or operator opinions are used in the determination. Findings are discussed from a program of research attempting to explain the measure dissociation in terms of a cognitive model of processing resources. The implications of this dissociation for system design are summarized. D.H.

A86-28451
EFFECTS OF TASK DIFFICULTY AND LEARNING STRATEGIES IN MULTIPLE-TASK TRAINING
P. S. WINNE (Norfolk General Hospital, VA), R. B. MOE, and B. B. MORGAN, JR. (Old Dominion University, Norfolk, VA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 1026-1031. refs

In two experiments, dual-task acquisition of mental arithmetic skills was investigated. In Experiment I, subjects practiced single-digit math under one of two dual-task combinations differing in functional similarity. In Experiment II, subjects practiced two-digit math under four combinations load and variety. The results indicated that learning was influenced by the task load imposed and specific-task characteristics. Analysis of the performance strategies involved provided a useful means for diagnosing sources of task overload. Author

A86-28452*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
VISUAL SCANNING BEHAVIOR
R. L. HARRIS, SR. and A. A. SPADY, JR. (NASA, Langley Research Center, Hampton, VA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 1032-1039. refs

This report summarizes the results and knowledge of scan behavior gained in various simulation and laboratory studies. Results were obtained through various analysis techniques such as real-time viewing of the pilot's scanning behavior and quantitative analysis of scan behavior performance parameters (average dwell time, dwell percentages, instrument transition paths, dwell percentages, instrument transition paths, dwell histograms, and entropy rate measures). Pilot scan behavior is discussed in the following areas; scanning is a subconscious conditioned activity, scanning is situation dependent, pilots' scanning pattern is centered around a home base. Scanning behavior data nave been shown to be useful in determining pilot's workload, evaluating pilot's strategy and role, determining the rate of information transfer of various displays, and aiding in pilot training. Author

A86-28812* California Univ., Davis.
PSYCHOLOGICAL AND INTERPERSONAL ADAPTATION TO MARS MISSIONS
A. A. HARRISON (California, University, Davis) and M. M. CONNORS (NASA, Ames Research Center, Moffett Field, CA) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 643-654. refs
(AAS 84-186)

The crucial importance of a thorough understanding of the psychological and interpersonal dimensions of Mars flights is indicated. This is necessary both to reduce the chances that psychological problems or interpersonal frictions will threaten the success of Mars missions and to enhance the quality of life of the people involved. Adaptation to interplanetary flight will depend on an interplay of the psychological stresses imposed by the missions and the psychological strengths and vulnerabilities of the crewmembers involved. Stresses may be reduced through environmental engineering, manipulating crew composition, and the structuring of situations and tasks. Vulnerabilities may be reduced through improving personnel selection procedures, training personnel in psychological and group dynamics, and providing mechanisms for emotional support. It is essential to supplement anecdotal evidence regarding the human side of space travel with the results of carefully conducted scientific research. D.H.

A86-28814
PSYCHOLOGICAL CONSIDERATIONS IN LONG-DURATION SPACE MISSIONS AN OVERVIEW
V. M. LITTLEFIELD (Minnesota, University, Morris) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 665-680. refs
(AAS 84-188)

Practical and potential contributions of psychology and the behavioral sciences to space missions to improve their chances of success are examined. Previous contributions have been minimal. Increase contributions have been suggested, such as selecting personnel who possess unique psychological characteristics and interpersonal skills appropriate to space missions. To this end, behavior has been studied in earth analogs that appear to model space mission environments. Denying that space missions are unique, other researchers have suggested a 'business-as-usual' perspective. Consideration of long-duration space missions, such as Mars missions, as routine phenomena opens the door to a previously excluded body of general individual and social psychological literature. This broader viewpoint is exemplified in (1) the presentation of an environmental learning view of individual psychology and (2) examination of social psychological research in group structure and processes from a primary group perspective. D.H.

A86-28864* Virginia Polytechnic Inst. and State Univ., Blacksburg.
EVALUATION OF 16 MEASURES OF MENTAL WORKLOAD USING A SIMULATED FLIGHT TASK EMPHASIZING MEDIATIONAL ACTIVITY
W. W. WIERWILLE, M. RAHIMI, and J. G. CASALI (Virginia Polytechnic Institute and State University, Blacksburg) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 489-502. Research supported by the Virginia Polytechnic Institute and State University. refs
(Contract NAG2-17)

As aircraft and other systems become more automated, a shift is occurring in human operator participation in these systems. This shift is away from manual control and toward activities that tap the higher mental functioning of human operators. Therefore, an experiment was performed in a moving-base flight simulator to assess mediational (cognitive) workload measurement. Specifically, 16 workload estimation techniques were evaluated as to their sensitivity and intrusion in a flight task emphasizing mediational behavior. Task loading, using navigation problems presented on a display, was treated as an independent variable, and workload-measure values were treated as dependent variables. Results indicate that two mediational task measures, two rating scale measures, time estimation, and two eye behavior measures were reliably sensitive to mediational loading. The time estimation measure did, however, intrude on mediational task performance. Several of the remaining measures were completely insensitive to mediational load. Author

A86-28866* Purdue Univ., West Lafayette, Ind.
ON SCALING PERFORMANCE OPERATING CHARACTERISTICS - CAVEAT EMPTOR
B. H. KANTOWITZ and M. WELDON (Purdue University, West Lafayette, IN) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 531-547. refs
(Contract NCC2-228)

Problems associated with scaling and normalizing empirical performance operating characteristics (POCs) are examined. Normalization methods proposed by Wickens (1980) and by Mountford and North (1980) are critically evaluated. Computer simulations are used to generate raw-score and normalized POCs. The interpretation of transformed empirical POCs (Wickens, Mountford, and Schreiner, 1981) is shown to contain inconsistencies. The normalization techniques reviewed fail to resolve POC scaling problems. Caution must be exercised when interpreting transformed POCs. Author

A86-28867* Illinois Univ., Champaign.
POCS AND PERFORMANCE DECREMENTS - A REPLY TO KANTOWITZ AND WELDON
C. D. WICKENS and Y.-Y. YEH (Illinois, University, Champaign) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 549-554. refs
(Contract NAG2-169)

A86-29090
A REVIEW OF THE PSYCHOLOGICAL ASPECTS OF SPACE FLIGHT
J. M. CHRISTENSEN (Federation of American Societies for Experimental Biology, Bethesda, MD; Universal Energy Systems, Inc., Dayton, OH) and J. M. TALBOT (Federation of American Societies for Experimental Biology, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 203-212. refs

The major observations and conclusions of the FASEB's ad hoc Working Group's report to NASA on the aspects of human behavior and performance related to the Shuttle Program and to the planned U.S. Space Station are presented. The report focuses on the performance requirements for the long-term manned missions; human perceptual, cognitive, and motor capabilities and limitations in space; crew composition, individual competences, selection criteria, and special training; and environmental factors influencing behavior. Consideration is also given to the psychosocial aspects of multi-person spacecrews on long-term missions; career determinants in NASA; investigational methodology and equipment; and psychological support. Suggestions for near-term planning cover uses of the Shuttle onboard video and audio resources for the behavioral observations, and include the perceptual, cognitive, and psychomotor parameters and group dynamics into space station mock-up studies. For the long-term research, the need of methodology and instrumentation for objective measurements of psychophysiological processes, status, and performance is emphasized. I.S.

A86-29095
PERFORMANCE OVERNIGHT IN SHIFTWORKERS OPERATING A DAY-NIGHT SCHEDULE
R. G. BORLAND, A. S. ROGERS, A. N. NICHOLSON, P. A. PASCOE, and M. B. SPENCER (RAF, Institute of Aviation Medicine, Farnborough, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 241-249. refs

Performance was measured during the day (0800-1700 hours) and during the night (1700-0800 hours) of a day-night schedule, and the effect of caffeine (300 mg) was studied during the overnight periods of work. The sleep electroencephalogram was recorded together with oral temperature and urinary electrolyte excretion.

Impairment of performance within 9 h after the beginning of the daytime work period was minimal, and was limited to a test of continuous performance, but impairment of performance within 9 h after the beginning of the overnight work period was more pronounced and included lowered vigilance. Impaired performance overnight was related to time on task and circadian rhythmicity, and was alleviated to some extent by the use of caffeine.
Author

A86-29098
HYSTERICAL DEAFNESS - AN UNUSUAL PRESENTATION OF STRESS IN AN AIR TRAFFIC CONTROL OFFICER
V. B. MAXWELL and D. N. BROOKS (Gatley Health Centre, England) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 263-266.

N86-21138*# Federation of American Societies for Experimental Biology, Bethesda, Md. Life Sciences Research Office.
RESEARCH OPPORTUNITIES ON IMMUNOCOMPETENCE IN SPACE
W. R. BEISEL, ed. and J. M. TALBOT, ed. Dec. 1985 54 p refs
(Contract NASW-3924)
(NASA-CR-176482; NAS 1.26:176482) Avail: NTIS HC A04/MF A01 CSCL 05I

The most significant of the available data on the effects of space flight on immunocompetences and the potential operational and clinical significance of reported changes are as follows: (1) reduced postflight blastogenic response of peripheral lymphocytes from space crew members; (2) postflight neutrophilia persisting up to 7 days; (3) gingival inflammation of the Skylab astronauts; (4) postflight lymphocytopenia, eosinopenia, and monocytopenia; (5) modifications and shifts in the microflora of space crews and spacecraft; and (6) microbial contamination of cabin air and drinking water. These responses and data disclose numerous gaps in the knowledge that is essential for an adequate understanding of space-related changes in immunocompetence. Author

N86-21139*# Illinois Univ., Urbana-Champaign. Engineering Psychology Research Lab.
THE DISSOCIATION OF SUBJECTIVE MEASURES OF MENTAL WORKLOAD AND PERFORMANCE Final Report
Y. H. YEH and C. D. WICKENS Oct. 1984 98 p
(Contract NAG2-169)
(NASA-CR-176609; NAS 1.26:176609; EPL-84-2/NASA-84-2)
Avail: NTIS HC A05/MF A01 CSCL 05I

Dissociation between performance and subjective workload measures was investigated in the theoretical framework of the multiple resources model. Subjective measures do not preserve the vector characteristics in the multidimensional space described by the model. A theory of dissociation was proposed to locate the sources that may produce dissociation between the two workload measures. According to the theory, performance is affected by every aspect of processing whereas subjective workload is sensitive to the amount of aggregate resource investment and is dominated by the demands on the perceptual/central resources. The proposed theory was tested in three experiments. Results showed that performance improved but subjective workload was elevated with an increasing amount of resource investment. Furthermore, subjective workload was not as sensitive as was performance to differences in the amount of resource competition between two tasks. The demand on perceptual/central resources was found to be the most salient component of subjective workload. Dissociation occurred when the demand on this component was increased by the number of concurrent tasks or by the number of display elements. However, demands on response resources were weighted in subjective introspection as much as demands on perceptual/central resources. The implications of these results for workload practitioners are described. Author

N86-21140# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
THE EFFECT OF ACCELERATION STRESS ON HUMAN WORKLOAD
W. B. ALBERY, S. L. WARD, and R. T. GILL May 1985 26 p
(Contract AF PROJ. 7231)
(AD-A156770; AMRL-TR-85-039) Avail: NTIS HC A03/MF A01 CSCL 06S

The effects of +Gz stress on operator task performance and workload are assessed. Subjects were presented a two-dimensional maze on a CRT, and were required to solve it as rapidly as possible while under G-stress at levels from +Gz to +6Gz. The G-stress was provided by a human centrifuge. The effects of this stress were assessed by two techniques: objective performance measures on the primary maze - solving task, and subjective workload measures obtained using the Subjective Workload Assessment Technique (SWAT). It was found that while neither moderate (+3Gz) nor high (+5Gz and +6Gz) levels of G stress affected maze solving performance, the high G levels did significantly increase the subjective workload of the maze task.
Author

N86-21141# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
ATTENTION ALLOCATION, DISTRACTION, AND THE TYPE A/TYPE B BEHAVIOR PATTERN M.S. Thesis
A. J. GUARDINO Aug. 1985 100 p
(AD-A160671; AFIT/CI/NR-85-109T) Avail: NTIS HC A05/MF A01 CSCL 05J

This thesis sought to determine whether individuals identified as having a Type A or Type B behavior pattern allocate attention differently in the presence of a distractor. Thirty-seven university students, grouped by type through use of the Jenkins Activity survey, and further divided into distractor and control groups, performed two discrete tasks for eight blocks under single- then dual-task conditions. The distractor was presented during the dual-task condition on Blocks 6 and 7. While the results did not support the hypothesized relation, this study did support previous findings of a differential effect of noise on multiple-task performance: Both quiet groups' performance improved on both tasks, whereas both noise groups' performance improved on the primary task but leveled off on the secondary task during and after the distractor. Further research is required. GRA

N86-21142# Colorado Univ., Boulder.
PRINCIPLES OF INSTRUCTION FOR SUCCESSFUL ASSEMBLY AND REPAIR Final Report, 1 Nov. 1983 - 31 Nov. 1984
P. BAGGETT 31 Nov. 1984 14 p
(Contract N00014-84-C-0112)
(AD-A161280) Avail: NTIS HC A02/MF A01 CSCL 05I

In this one-year project the aim was to continue the previous three years' research on designing multimedia instructions for procedures so that people could use and learn from them more easily. There were both theoretical and practical aspects to the work. We viewed the conceptual structure of a task as a (hierarchical) tree (later a directed acyclic graph) with nodes representing information from different modalities (motoric, visual, and linguistic). The overview will be preceded by a short summary, stating the five main studies, the total number of subject hours run, stimulus materials used, and computer programming done. At the end are listed technical reports, conference papers, and publications. Main Studies: (1) Transforming a task's tree structure to lessen short term memory load in instructions, (2) Developing generic and functional terminology, (3) Theoretical hypotheses about what narration in dual media presentations should consists of, (4) Transfer of learning in assembly tasks, and (5) Empirical investigation of adequacy of knowledge representation for repair in a computerized tutor. GRA

N86-21143# California Univ., San Diego. Jolla.
INTERACTIVE ACTIVATION MODELS OF PERCEPTION AND COMPREHENSION Status Report, 1 Dec. 1984 - 1 Oct. 1985
J. L. ELMAN and J. L. MCCLELLAND 1 Oct. 1985 15 p
(Contract N00014-85-K-0076)
(AD-A161362) Avail: NTIS HC A02/MF A01 CSCL 05J

The objective of this research is to construct a computationally sufficient, biologically plausible, and behaviorally adequate account of human information processing skills in visual and auditory language processing. We have the following specific research goals for our contract: (1) To implement a model of reading printed text through a series of fixations. The model is intended to account for the integration of visual information over successive fixations, and the interaction of visual and contextual information in reading. (2) To implement a new version of our model of speech perception (TRACE), using programmable connections to allow the model to tune itself, in the course of processing, to changes in global parameters such as rate. This new model (which we will call the Programmable TRACE) is intended to account for human sensitivity to global as well as local contextual influences on the speech signal while retaining all the virtures of the present version of TRACE. (3) To begin work on the development of simulation models designed to capture aspects of interactions between lexical, syntactic, and semantic constraints on the construction of syntactic and functional representations of sentences. GRA

N86-21144# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision Systems.
A PROCEDURE-BASED APPROACH TO HUMAN INFORMATION PROCESSING MODELS
K. L. BOETTCHER and R. R. TENNEY Nov. 1985 37 p
(Contract N00014-77-C-0532; N00014-84-K-0519)
(AD-A162454; LIDS-P-1499) Avail: NTIS HC A03/MF A01 CSCL 05J

An approach is suggested for modeling human processing time in routine tasks. The existence of mental processing methods, or procedures, is presumed and the approach uses information theoretic concepts to develop a functional relationship between task variables and processing time for a given procedure. The resulting model contains parameters that must be estimated using processing time data. In addition to considering the single-procedure model, the modeling framework is extended to include situations where multiple procedures are used in an alternate fashion. The information theoretic framework provides a specific model form for the extra time required for switching to, or activating, a procedure. The modeling approach is tested experimentally in two ways. First, a single procedure task is devised for which a model is developed. Second, a multiple procedure task is devised to test the model for switching. Experimental results in both cases give evidence in support of the approach as a method for describing task processing time in terms of task variables. Author (GRA)

N86-21145# Leiden Univ. (Netherlands). Inst. of Mathematics.
ON INTERACTING POPULATIONS THAT DISPERSE TO AVOID CROWDING: THE EFFECT OF A SEDENTARY COLONY
M. BERTSCH, M. E. GURTIN (Carnegie-Mellon Univ., Pittsburgh, Pa.), D. HILHORST, and L. A. PELETIER Mar. 1983 30 p refs
(REPT-4) Avail: NTIS HC A03/MF A01

A population model in which a finite number of interacting groups attempt to avoid crowding is considered. A habitat containing a mobile and a sedantary species is studied. It is shown that when the mobile population is sufficiently large relative to the sedentary population, the mobile species eventually populates the entire habitat. However, when mobile species density is less than that of the sedentary species, the mobile individuals do not reach the portion of the habitat that lies to the other side of the sedentary colony. Author (ESA)

N86-22106 Arizona Univ., Tucson.
VISUAL PERCEPTION IN CORRELATED NOISE Ph.D. Thesis
K. J. MYERS 1985 149 p
Avail: Univ. Microfilms Order No. DA8522817

The ability of human observers to perform detection tasks in medical images that contain structured noise was investigated. Physical measures of image quality, such as signal-to-noise ratio (SNR), resolution, modulation transfer function (MTF), and contrast, do not accurately predict how well an observer can detect lesions in an image. For images with equal pixel SNR, humans can detect a low contrast object more readily in images that have a low-pass noise structure, as opposed to a high-pass noise structure. This finding is important in the comparison of images generated by a classical pinhole-imaging system with images generated by a computed tomography imager. A figure of merit was wanted for imaging systems that is more than an evaluation of the physician's performance, measured using human observers and an accepted method such as receiver operating characteristic techniques. The hypothesis is that the human observe acts approximately as an ideal observer who does not have the ability to prewhiten the noise in an image. Without this ability, the ideal observer's detection performance for even a simple task is degraded substantially in correlated noise. This is just the effect found for human observers. Dissert. Abstr.

N86-22107# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
PERSONALITY TYPE ANALYSIS OF AIR FORCE INSTITUTE OF TECHNOLOGY SCHOOL OF SYSTEMS AND LOGISTICS GRADUATE DEGREE 85S CLASS USING MYERS-BRIGGS TYPE-INDICATOR M.S. Thesis
R. A. CARTER Sep. 1985 146 p
(AD-A161053; AFIT/GLM/LSM/85S-11) Avail: NTIS HC A07/MF A01 CSCL 05J

The objective of this research was to identify significant learning differences in the AFIT School of Systems and Logistics (AFIT/LS) using the personality type theory developed by psychologist Jung and identified by the Myers-Briggs Type Indicator (MBTI). The data were collected from graduate students of AFIT/LS through the MBTI and a Preferred Academic Environment Questionnaire. Results of the MBTI categorized each of the subjects into personality types. The Preferred Academic Environment Questionnaire determined student habits test taking preferences: AFIT situations which the student felt improved academic performance; and AFIT learning situations which were important to the student. The data were analyzed according to the distribution of MBTI type, the effect of MBTI type upon grade point average, and student preference for instructional technique and learning styles as they related to MBTI type. GRA

N86-22108# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECTS OF COLOR-CODING IN GEOSIT DISPLAYS. 1: COLOR AS A REDUNDANT CODE Interim Report
A. R. JACOBSEN, D. F. NERI, and W. H. ROGERS 13 Sep. 1985 20 p
(AD-A161107; NSMRL-1061) Avail: NTIS HC A02/MF A01 CSCL 05H

The effect of color-coding symbols in geographical situation (GEOSIT) displays on response time was studied using 12 observers. Three levels of the threat dimension (friendly, unknown, and hostile) were redundantly coded by both color and shape, while the three levels of the platform dimension (submerged, surface, and airborne) were coded only by shape. Compared to the standard monochrome coding scheme, response time on the color-coded threat dimension was enhanced by over 100%. Performance on the noncolor-coded platform dimension was unaffected by color-coding of the threat dimension. Several other significant effects were also found. This study demonstrates that the use of color in GEOSIT displays can dramatically improve performance without any decrement in performance on noncolor-coded information. GRA

N86-22109# Naval Health Research Center, San Diego, Calif.
HEALTH AND PERFORMANCE OF ANTARCTIC WINTER-OVER PERSONNEL: A FOLLOW-UP STUDY Final Report
L. A. PALINKAS Jun. 1985 15 p
(AD-A161773; NAVHLTHRSCHC-85-18) Avail: NTIS HC A02/MF A01 CSCL 06J

Despite extensive previous research on the health and performance of Antarctic winter-over personnel while they are on the ice, little is known about the long-term effects of the winter-over experience. Using the records of enlisted personnel who applied to the Operation Deep Freeze program between 1963 and 1973, the health and service history data available on these individuals at the Naval health Research Center were examined to determine if incidence rates and performance criteria were significantly different between a group of winter-over personnel and a control group of enlisted personnel who were rated as acceptable by a screening team but who did not winter over. Results indicated that the overall incidence rate for the winter-over group was significantly lower than the rate for the control group. The winter-over group also had significantly fewer first hospitalizations for neoplasms, endocrine, nutritional, and metabolic disorders, and diseases of the musculoskeletal system. Results suggest that wintering over does not adversely affect subsequent health and performance of enlisted personnel, and that the screening program has been successful in selecting the best candidates in terms of these criteria. GRA

N86-22110# Army Construction Engineering Research Lab., Champaign, Ill.
THE ROLE OF VIBRATION AND RATTLE IN HUMAN RESPONSE TO HELICOPTER NOISE Final Report
P. D. SCHOMER and R. D. NEATHAMMER Sep. 1985 161 p
(AD-A162486; CERL-TR-N-85/14) Avail: NTIS HC A08/MF A01 CSCL 05J

Our understanding of community reaction to helicopter noise remains incomplete. A technique called A-weighting appears to produce realistic data outdoors and at modest noise levels, and the community response in terms of percentage of population highly annoyed can be correlated with respect to the Day/Night Average Sound Level (DNL) descriptor. However, questions remain as to the effect of perceived building vibrations and rattle in human response to helicopter noise. To answer these questions, this study examined the role of vibration and rattle in human response to helicopter noise. Many volunteer subjects were tested under real noise conditions. The helicopter noise was generated by an Army UH-1H (Huey) helicopter. Subjects were located either in the living room of a new mobile home, outdoors, or in the living room or dining room of an old frame farmhouse near Champaign IL. The control or comparison sound was generated electronically through loudspeakers at each location using a 500-Hz octave band of white noise. By performing paired comparison tests between the helicopter and control noises, it was possible to establish equivalency between these two stimuli. Author (GRA)

N86-22111# Yale Univ., New Haven, Conn. Dept. of Psychology.
ATTENTION WITHIN AUDITORY WORD PERCEPTION Final Report, 1 Jan. 1982 - 31 Dec. 1983
A. G. SAMUEL and W. H. RESSLER Nov. 1985 58 p
(Contract N00014-82-C-0160)
(AD-A162550; REPT-85-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 06P

Phonemic restoration is a powerful auditory illusion that arises when a phoneme is removed from a word and replaced with noise, resulting in a percept which sounds like the intact word with a spurious bit of noise. It is hypothesized that the configurational properties of the word impair attention to the individual phonemes and thereby induce perceptual restoration of the missing phoneme. If so, this impairment might be unlearned if listeners can process individual phonemes within a word selectively. Subjects received training with the potentially restorable stimuli (972 trials with feedback); in addition, the presence or absence of an attentional cue, contained in a visual prime preceding each trial, was varied between groups of subjects. Cueing the identity and location of the critical phoneme of each test word allowed subjects to attend to the critical phoneme, thereby inhibiting the illusion, but only when the prime also identified the test word itself. When the prime only provided the identity or location of the critical phoneme, or only the identity of the word, subjects performed identically to those subjects for whom the prime contained no information at all about the test word. Furthermore, training did not produce any generalized learning about the types of stimuli used. A limited interactive model of auditory word perception is discussed, in which attention operates through the lexical level. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-26493#
TELEROBOTICS FOR THE SPACE STATION
M. M. CLARKE and M. A. BRONEZ (Rockwell International Corp., Space Station Systems Div., Downey, CA) Mechanical Engineering (ISSN 0025-6501), vol. 108, Feb. 1986, p. 66-72.

An evaluation is made of the configurational possibilities of the NASA Space Station, with a view to the range of EVA efforts that will have to be undertaken by Space Shuttle-based construction crews, and with emphasis on the character and effectiveness of the remote operation, or 'teleoperator' and robotic systems that such construction crews may employ to more effectively conduct Space Station assembly. Teleoperators are dexterous, general purpose man/machine systems that project human vision and manipulation capabilities across distances and through physical barriers. Telerobots are teleoperators to which cybernetic sensor and control systems have imparted a degree of autonomy from human direction. Attention is given to the sensor and actuation systems proposed for implementation of teleoperators and telerobots. O.C.

A86-26616#
KINEMATICS AND REACTION MOMENT COMPENSATION FOR A SPACEBORNE ELBOW MANIPULATOR
R. E. LINDBERG, R. W. LONGMAN, and M. F. ZEDD (U.S. Navy, Naval Research Laboratory, Washington, DC) AIAA, Aerospace Sciences Meeting, 24th, Reno, NV, Jan. 6-9, 1986. 26 p.
(AIAA PAPER 86-0250)

When a robot arm is mounted on a satellite, the commanded arm motions induce motions of the satellite and therefore of the robot base. As a result, the robot joint angles that would normally be commanded to produce a prescribed robot end effector position and orientation will result in missing the target. Also as a result of uncontrolled base motion, the terminal end effector state is not a function of terminal joint angles, but is rather determined by the entire joint angle history. The kinematics of the system is therefore coupled with the dynamics of system, and the inverse kinematics problem cannot be solved in closed form. This paper develops a new type of robot kinematic equation set that computes joint angle commands that account for base translation, under the assumption that base rotation is negated by a momentum compensation system mounted on the satellite. Author

A86-27094
MODELING OF PERCEPTION AND DECISION-MAKING PROCESSES [MODELIROVANIE PROTSESSOV VOSPRIIATIIA I PRINIATIIA RESHENII]
V. O. KURT-UMEROV and O. I. KHOMA Otbor i Peredacha Informatsii (ISSN 0474-8662), no. 72, 1985, p. 54-61. In Russian.

A model of perception and decision making with the description of functional blocks is proposed. The model relies on the concept of a thesaurus, consisting of three set-images, analysis and synthesis methods, and action algorithms. Other principles include the novel information concept, and the time constants of image adaptation to sequence monotonicity and self-learning in the class of images analyzed. Appropriate schematics are presented. B.J.

A86-27500
A MODEL FOR THE FORMATION OF THE STRUCTURE OF THE EXTERNAL ELECTRIC FIELD OF HUMANS [OB ODNOI MODELI FORMIROVANIIA STRUKTURY VNESHNEGO ELEKTRICHESKOGO POLIA CHELOVEKA]
IU. V. TORNUEV (Institut Fiziologii, Novosibirsk, USSR) Bionika (ISSN 0374-6569), no. 19, 1985, p. 97-100. In Russian. refs

The frequency and spatial characteristics of the external electric field (EEF) of humans are analyzed. A model for the formation of the EEF structure is proposed which is based on the representation of the human body in the form of a complex system of dielectrics with a complex permittivity. Experimental data obtained for various physiological states confirm the validity of the model. B.J.

A86-27671
VESTIBULAR AND VISUAL CONTROL ON POSTURE AND LOCOMOTOR EQUILIBRIUM
M. IGARASHI, ED. and F. O. BLACK, ED. Basel and New York, Karger, 1985, 375 p. No individual items are abstracted in this volume.

The topics discussed include conceptual and biomechanical models of postural control, quantitative analysis of postural control mechanisms, visual and vestibular control of equilibrium function, space environment and equilibrium psychophysiology, neurophysiology in relation to postural and motor control, developmental and oculomotor studies, and pathological disorders and postural control. Papers are presented on conceptual models of human postural control, analysis of labyrinthine equilibrium disturbances by fitting a five-dimensional feedback model, four steps of application of postural control mechanism to clincial diagnosis, habituation of postural readjustments induced by motion of visual scenes, and subjective vertical in weightlessness. Consideration is also given to mechanisms of posture maintenance in weightlessness, otolith-spinal reflexes, contribution of peripheral vision to vestibulo-ocular reflex suppression, and postural control in four classes of vestibular abnormalities. I.S.

A86-28074
DESIGN TECHNIQUES FOR ROBOTS - SPACE APPLICATIONS
R. J. HAMANN (Fokker, Schiphol, Netherlands) Robotics (ISSN 0167-8493), vol. 1, Dec. 1985, p. 223-250.

Analytical techniques and technologies required for the design and development of robotic manipulators in space are defined and investigated. A space manipulator system is defined and described, and manipulator kinematics and dynamics, methods for path construction, obstacle avoidance techniques, and robot languages are discussed. Control aspects are investigated, including robot control methods, the selection of a Manipulator Arm control system, and the definition of simulation cases. Manipulator Arm functions to be performed and their requirements in terms of processing power, memory size, and data flows are listed and used to define the electrical architecture, bus requirements, and software organization. A program for future design studies for the Manipulator Arm is briefly discussed. C.D.

A86-28285
EUROPEAN ANNUAL CONFERENCE ON HUMAN DECISION MAKING AND MANUAL CONTROL, 4TH, ZEIST, NETHERLANDS, MAY 28-30, 1984, PROCEEDINGS
Soesterberg, Netherlands, Institute for Perception TNO, 1985, 294 p. No individual items are abstracted in this volume.

Various papers on human decision making and manual control are presented. The general topics addressed include: rehabilitation, artificial intelligence, fault management and decision making, industrial processes, human behavior in aircraft piloting and car driving, information and control. Some individual topics discussed include: information processing and driving ability of patients with diffuse brain injury, theory and tests in fault management, development of individual assembly strategies, gravitational torques in manual control, the dynamics of a car driver's lane-keeping behavior, systems ergonomic analysis of ship engine control tasks, using time-series information in an optimization task, evaluation of overview pictures for process supervision, and internal models of process dynamics in slow human-machine systems. C.D.

A86-28431
COMPARISON OF TRANSIENT AND STEADY STATE CORTICAL EVOKED POTENTIALS
A. M. JUNKER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), K. M. KENNER (Synergy, Inc., Washington, DC), D. L. KLEINMAN (Connecticut, University, Storrs), and T. D. MCCLURG (Systems Research Laboratories, Inc., Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 854-860. refs
(Contract AF TASK 2312V2)

To better describe the linear-dynamic properties of the human visual-cortical response system, transient and steady state visual evoked response potentials (VERP) were observed. The stimulus presentation device provides both the evoking stimulus (flickering or pulsing lights) and a video task display. The steady state stimulus was modulated by a complex, ten-frequency, sum-of-sines, wave. The transient VERP is the time-locked averaged of the EEG to a series of narrow light pulses (pulse width of 10 msec). The Fourier transform of the averaged pulses has properties that approximate band limited white noise, i.e. a flat spectrum over the frequency region spanned by the 10 sum of sines. The Fourier transform of both the steady-state and the transient evoked potentials yields measures of: output/input gain ratios, phase differences, and background EEG. The transfer function from the transient VERP corresponds to the steady-state VERP transfer function. Author

A86-28432
A LINEAR, DYNAMIC MODEL FOR THE VISUAL-CORTICAL EVOKED RESPONSE SYSTEM
K. M. KENNER (Synergy, Inc., Washington, DC), A. M. JUNKER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), and W. H. LEVISON (Bolt Beranek, and Newman, Inc., Cambridge, MA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 861-867. refs

A technique for developing an unobtrusive workload metric based upon steady-state EEG may be useful for in-flight crew monitoring. In the process of developing this technique, linear-dynamic properties of the human visual-cortical response system have been observed. Mathematical modeling has been successfully applied to these observations. The development of this model indicates the potential for applying the control-theoretic perspective to neurosensory functioning. Further statistical analysis of an expanded data-base could lead to the development of an unobtrusive workload metric. Author

A86-28433
A WORKLOAD INDEX FOR ITERATIVE CREWSTATION EVALUATION
R. A. NORTH (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 868-872. refs

A crewstation design tool is reviewed which allows the human factors engineer to assess the attentional demands that will be imposed on the human operator given the tasks, times of performance, time-sharing demands, individual task difficulties, and human interfaces to be used. Attention and performance theories used in the workload model are discussed. A crewstation design problem example is used to illustrate the utility of the tool in pointing to automation needs and potential reallocation of tasks to display/control surfaces. Author

A86-28434
WORKLOAD ASSESSMENT TECHNIQUES IN SYSTEM REDESIGN
W. H. ACTON (Systems Research Laboratories, Inc., Dayton, OH) and M. S. CRABTREE (Universal Energy Systems, Inc., Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 873-877. refs

This paper describes the workload assessment portion of a human factors effort to help develop an improved version of an existing military command, control, and communications system. In the phase, the current system was studied in order to identify specific design features that detrimentally affected operator performance and workload. Both subjective and objective workload data were collected. In the second phase of the effort, a mock-up version of the modified system (currently being developed) was evaluated for workload using a projective technique for subjective workload assessment (ProSWAT). Workload levels for the new system appeared acceptable, and operator acceptance was favorable. The paper emphasizes important considerations for the selection and application of workload metrics. Author

A86-28436
COMPUTER-BASED TOOLS FOR COCKPIT DESIGN
L. C. BUTTERBAUGH, J. K. MCBRIDE (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH), and P. W. GRIFFITH (BDM Corp., Dayton, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 886-891. refs

A collection of computer-based human factor design tools is described that can assist crew system engineers to evaluate various cockpit layouts in the preliminary design phase. The current capabilities include: reach analysis, workload analysis, system modeling, and display format design. The tools are accessed through a common interface called the User-Interface Module or UIM. A key feature of the UIM is its user-friendly menu-driven series of prompts to access a tool. The combined set of tools and the UIM make up the Computer-Aided Design and Evaluation (CADET) system. D.H.

A86-28437
A METHODOLOGY FOR ADDRESSING SYSTEM OPERABILITY ISSUES
R. N. CHARETTE and R. H. WALLACE (SofTech, Inc., Middletown, RI) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 900-905. refs

A methodology has been developed to deal with the 'system operability problem', which results from the exclusion of the human resource from the systems engineering process with the consequence that new systems often exhibit only marginal gains in effectiveness. The new methodology is called SOEM, for System Operability Evaluation Methodology. It consists of three methods: the U.S. Air Force's IDEF (Integrated Computer Aided Manufacturing Definition Method), the U.S. Navy Research Laboratory's SCRP (Software Cost Reduction Project) techniques, and the U.S. Air Force's simulation language and methodology SAINT (System Analysis of Integrated Networks of Tasks). SOEM is a fully integrated methodology which models the human, equipment, mission and operating environment aspects of a system. D.H.

A86-28438
INCORPORATING HUMAN OPERATOR CONSIDERATIONS INTO EXISTING WEAPON SYSTEM ANALYSIS AND QUANTIFICATION CAPABILITIES
C. M. HOYLAND, K. H. EVERS (SofTech, Inc., Dayton, OH), and D. E. SNYDER (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 911-916. refs

An approach is discussed for combining two existing models to provide an analysis and simulation capability that combines the effects of the hardware/software as well as the human operator components of a weapon delivery system. A specific example is considered, based on an existing hardware/sofware simulation called SAMS (Surface-to-Air Missile Simulation) and a digital simulation of a human operator of a SAM system called SPAMSS (SAINT Performance Assessment Model of a SAM System). Through an integration process, the system's hardware/software and human operator components can be simulated without redesigning the simulations that already exist. D.H.

A86-28439#
TARGET DESIGNATION BY SPEECH, JOYSTICK, AND TOUCH CONTROL FORMAT DESIGN IMPLICATIONS
D. G. CURRY, J.M. REISING, and J. P. ZENYUH (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 923-928. refs

This paper discusses an experiment comparing three different methods of positioning cursors on an interactive display device for use in future aircraft cockpits. The methods evaluated include standard joysticks, touch sensitive overlays, and an unconstrained voice recognition system. All comparisons were performed with subjects wearing both normal flight gear and equipment from the aircrew chemical protective ensemble, with all subjects performing a primary loading task similiar in nature to flying a single-seat fighter. Format design implications for each control mode are discussed, with particular attention being focused on the difficulties involved in developing an effective voice cursor format. Author

A86-28440
EVALUATION OF HELMET DISPLAY FORMATS
J. DE MAIO, C. HARMAN, T. STRYBEL, R. PENNER, and J. BROCK (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 929-936. refs

Research was performed to evaluate the readability of flight control, navigation, and sensor pointing symbology on monocular, helmet-mounted display. Display readability was evaluated under two task-loading conditions: (1) single-task display reading only; and (2) multitask, head-down panel I/O task plus head-up target detection plus display reading. Two helmet display formats were evaluated. Configuration 1 was essentially of current attack helicopter symbology. Configuration 1 used reformatted symbology designed to reduce obscuration of the outside visual scene and to enhance readability. In the single-task conditions subjects scanned a static display for a target deviation of one parameter from a pre-assigned value. Dependent measures were error rate

and reaction time. In the multi-task experiment, reaction time was measured from completion of the detection task. Display reading accuracy was high for both display configurations. Results are discussed in terms of display readability. Author

A86-28441
UTILIZING COMPUTER GRAPHICS DISPLAY TECHNOLOGY
J. P. YORCHAK and J. E. ALLISON (Martin Marietta Corp, Denver, CO) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 937-942. refs

A review is given of recently published research concerned with cognition and computer graphics. Lessons learned from two experiments conducted at Martin Marietta Denver Aerospace, using complex interactive computer graphics displays, are discussed. In the first experiment, subjects tailored a tilted platter display of the earth (an azimuthal equidistant projection) to make it to their liking; they then had to make a true-false decision about a statement describing the altitude and coverage area of a particular satellite on each display. In the second experiment, some subjects were given additional cues in the form of polar and equatorial views from space of a satellite orbiting the earth (supplementing the standard Mercator projection showing the ground track). D.H.

A86-28442
AUDITORY SIGNALS IN MILITARY AIRCRAFT - ERGONOMIC PRINCIPLES VERSUS PRACTICE
T. J. DOLL and D. J. FOLDS (Georgia Institute of Technology, Atlanta) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 958-965. refs
(Contract F33615-82-D-0601)

The complete ensembles of auditory signals in selected USAF aircraft (the F-4D, F-15, two models of the F-16, the C-5, and the C-141) are described and evaluated. Human factors research related to the design of speech and non-speech auditory signals is reviewed. Major findings are: that auditory signals are not well standardized among the aircraft, even between those with similar combat roles; that a relatively large number of non-speech auditory signals are used, which may make it difficult for the aircrew to recall the meanings of all the signals; that some non-speech signals are sufficiently similar that they may be confused, particularly in high workload and stressful conditions; and that the criticality of the warnings is not reliably indicated by any characteristics of the signals. Four problem areas requiring further research are discussed: reduction of signal loudness, enhancement of the distinctiveness and masking resistance of non-speech signals, effects of concurrent warning signals on aircrew performance, and additional uses of auditory information. Author

A86-28444
DYNAMIC RETRAINING APPROACHES FOR AN AIRBORNE SPEECH RECOGNITION SYSTEM
R. A. NORTH and K. GRAFFUNDER (Honeywell Systems and Research Center, Minneapolis, MN) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 970-974.
(Contract F33615-83-C-3608)

Results of a preliminary investigation of the viability of dynamic updating of a word recognizer are reported. An isolated word recognizer was used to capture original templates and task oriented utterances for an aircraft cockpit radio frequency selection task performed by a group of student pilots. The task-oriented utterances were produced in low and high workload conditions to represent differing operational stress. Match scores between original templates and real-time utterances were compared with match scores between real-time vs. real-time utterances. Two strategies were formulated for improvement of match scores using certain real-time utterances as new templates, and one is demonstrated with laboratory data. Author

A86-28445
SPEECH COMPRESSION AS A POTENTIAL AID TO AUTOMATED VOICE WARNINGS IN THE COCKPIT
K. M. DRESEL (Boeing Military Airplane Co., Wichita, KS), D. J. GARDNER, A. APRILL, D. DEFRUITER, M. KEITH (Kearney State College, NE) et al. IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 975-978.

Previous research has investigated compressed speech in the continuous speed context but has not investigated the effect of compression on short phrases such as might be uttered by an automated voice warning system. The potential benefits of this technology are decreased system memory requirements, decreased message transmission time or increased message length. Undergraduates (N = 137) were tested in small groups to determine intelligibility of aviation-related short phrases. The design involved three rates of speech compression, three levels of pitch adjustment, male or female speaker, and male or female listeners. Significant differences were found for amount of compression, amount of pitch adjustment and the compression x pitch x sex of speaker interaction. These results are interpreted as supporting the use of compressed speech for automated voice warning systems in the cockpit. Author

A86-28446* Psycho-Linguistic Research Associates, Menlo Park, Calif.
SELECTING COCKPIT FUNCTIONS FOR SPEECH I/O TECHNOLOGY
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 979-986. Army-supported research. refs
(Contract NAS2-11341)

A general methodology for the initial selection of functions for speech generation and speech recognition technology is discussed. The SCR (Stimulus/Central-Processing/Response) compatibility model of Wickens et al. (1983) is examined, and its application is demonstrated for a particular cockpit display problem. Some limits of the applicability of that model are illustrated in the context of predicting overall pilot-aircraft system performance. A program of system performance measurement is recommended for the evaluation of candidate systems. It is suggested that no one measure of system performance can necessarily be depended upon to the exclusion of others. Systems response time, system accuracy, and pilot ratings are all important measures. Finally, these measures must be collected in the context of the total flight task environment. D.H.

A86-28453
WICKENS' RESOURCE ALLOCATION MODEL - IMPLICATIONS FOR THE DESIGN OF HUMAN-MACHINE SYSTEMS
L. A. WHITAKER (Missouri-St. Louis, University, St. Louis) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 1040-1044. refs

A fundamental question of systems design is examined: can one person operate a given system or will it take two? The answer depends on the load that the system imposes on the operator. The model of Wickens, Sandry and Vidulich (1983) suggests that a single operator can draw from a number of separate internal resources to perform a complex task (such as fly an aircraft, provide air traffic control, or execute underwater maintenance tasks). If this model is correct, then systems can be designed to make optimal use of these separate resources within a single operator. The model is discussed and available evidence tending to support or refute it is examined. Implications for the design of air traffic control communications are noted. D.H.

A86-28513
IMPROVING INTELLIGIBILITY IN AUDIO DISTRIBUTION SYSTEMS
P. J. GRECO (Telephonics Corp., Huntington, NY) IN: NAECON 1985; Proceedings of the National Aerospace and Electronics Conference, Dayton, OH, May 20-24, 1985. Volume 2 . New York, Institute of Electrical and Electronics Engineers, 1985, p. 1564-1569. refs

Some of the most current techniques for increasing intelligibility in audio distribution systems operating in high ambient noise environments (engine noise, weapons launch, helicopter rotor slap, etc.) are examined. As part of a program to develop the new Tri-Service Digital Audio Distribution System (DADS), a systems approach has been taken to improving intelligibility. The solutions include better noise canceling microphones, active signal enhancement at the audio input, and both passive and active noise canceling devices as the headset. Initial data show that intelligibility scores of better than 75 percent in pink noise environments greater than 115 dB SPL have been achieved.
D.H.

A86-28801
ADVANCED SPACESUIT GLOVE DESIGN
W. M. CLAPP (MIT, Cambridge, MA) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 469-488. refs
(AAS 84-175)

A lightweight pressure suit glove for the Martian environment has been developed based on the elastic pressurization concept. Elastic pressurization makes it possible to apply a mechanical counterpressure to the hand which is equal to the pressure of the air that a human would breathe in a conventional pressure suit. It is shown that the glove offers superior dexterity and tactile feedback in comparison with the Apollo A7L-B glove, and is less fatiguing to wear. Covering the glove with a protective layer to guard against micrometeoroids and radiation was found to be unneccessary in the case of the Martian environment, and the hand need only be protected from the comparatively moderate extremes of temperature. It is suggested that a full-length pressure suit could be developed on the basis of the elastic pressurization concept.
I.H.

A86-28806
THE RETRIEVAL, STORAGE, AND RECYCLING OF WATER FOR A MANNED BASE ON MARS
D. JONES, M. R. LAPOINTE, H. M. HART, A. LARSON (Colorado, University, Boulder), and C. F. WEBB (General Electric Co., Beverly, MA) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 537-556. refs
(AAS 84-180)

A system is described for supplying fresh water - a resource of primary importance to the success of a permanently manned base on Mars - for a 12-18 person base located in the Martian northern hemisphere. The integrated system provides scavenging of all water from waste gases, production of liberal quantities of buffer gas, the supply of water ice from the remnant northern cap during northern hemisphere summers, and efficient water usage and recycling. The scavenging system captures moisture with a molecular sieve and removes argon and oxygen from the atmosphere and airlock gases. Ice is shipped from a polar outpost via robot rovers to provide for expansion of water resources. The water recycling system is based on a Thermoelectric Integrated Membrane Evaporation system which purifies wastewater to drinking water standards. The load on the purification system is reduced through the use of a gray water system for washwater applications. Although no single system is enough to fulfill the water requirements of a permanently manned base on Mars, the integrated system can efficiently close the water cycle of the base.
D.H.

A86-28807
WATER SUPPLY FOR A MANNED MARS BASE
W. M. CLAPP (MIT, Cambridge, MA) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 557-566. refs
(AAS 84-181)

A water supply system for a manned Mars base is designed. Water is extracted from the Martian air by compressing it, then refrigerating it at constant pressure. When a compression ratio of 1.66 is selected, the energy required to produce one kilogram of water is minimized at 69.92 kw-Hr, of which 30.70 kw-Hr is used for the compression in an single-stage axial compressor of efficiency 0.98, and 39.22 kw-Hr is used for refrigeration in a vapor-cycle refrigerator using subcooling to achieve a coefficient of performance of 1.85. The system mass is approximately 20 kilograms, and the capacity of the system to produce water can be expanded by operating it for longer periods of time than the six hours per day upon which the above calculations are based.
Author

A86-28810
MASS-BALANCE MODEL FOR A CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM ON MARS
T. R. CAUDILL (Colorado, University, Boulder) IN: The case for Mars II . San Diego, CA, Univelt, Inc., 1985, p. 611-626. refs
(AAS 84-184)

The colonization of Mars is an instrumental step in the future expansion of the human race into the outer reaches of the solar system. One of the most difficult problems facing long term colonization of Mars is the supply of vital resources. This paper describes a model using a Controlled Ecological Life Support System (CELSS) which would help alleviate many logistical problems. The model outlines the usage of available Martian resources to maintain life. The results show that a closed system is theoretically feasible but there are many technical problems which must be solved before such a system can be utilized.
Author

A86-28865
REVIEW AND EVALUATION OF EMPIRICAL RESEARCH IN TROUBLESHOOTING
N. M. MORRIS and W. B. ROUSE (Search Technology, Inc., Norcross, GA) Human Factors (ISSN 0018-7208), vol. 27, Oct. 1985, p. 503-530. refs
(Contract N66001-83-R-0340)

Following an analysis of task requirements for successful troubleshooting, this paper considers human abilities, limitations, and inclinations with respect to troubleshooting. Research on the effects of various approaches to the training of troubleshooting is reviewed. The extent to which troubleshooting performance is influenced by instruction is highly related to the level of explicitness of action-related information provided. An approach that forces people to use their system knowledge explictly is a promising alternative to explicit instruction in algorithms or diagnostic heuristics, but such an approach is not supported by data from transfer studies. A combination of the two approaches may be the most effective means of teaching troubleshooting, and research evaluating the soundness of this idea should be conducted.
Author

A86-29092
HEAD-UP/HEAD-DOWN TRANSITION - MEASUREMENT OF TRANSITION TIMES
J.-P. R. MENU (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 218-222. DRET-supported research. refs

A method to measure transition times between a head-up display (HUD) signal and a response given to a head-down display (HDD) was developed, using a three-segmented paradigm and testing various vocal and manual arrangements in a fighter aircraft mock-up. The shortest transition times were obtained for voice responses (1600 msec between a HUD signal and a simple response to the HDD). A comparison of the perception and

transition times of a 'positive' contrast (green symbols on black background) with a 'negative' contrast (black symbols on green) has indicated both shorter perception and shorter transition times for the positive contrast. This method permits of the effects evaluation of changes in psychological conditions (such as heavier information processing) and physiological conditions (changing accommodation, gaze axis, and convergence) of a dynamic aeronautical environment on the speeds of acquisition and processing of information. I.S.

A86-29100
SHIP/RIG PERSONNEL ABANDONMENT AND HELICOPTER CREW/PASSENGER IMMERSION SUITS - THE REQUIREMENTS IN THE NORTH ATLANTIC
C. J. BROOKS (Department of National Defence, Maritime Command, Halifax, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, March 1986, p. 276-282. refs

A86-29497
PROCESSING AND PACKAGING - PREPARATION TECHNIQUES ENHANCE MEALS ON THE SHUTTLE
C. PREBLE Commercial Space (ISSN 8756-4831), vol. 1, Winter 1986, p. 58, 59, 61.

In addition to being nutritious, NASA Space Shuttle menu items are expected to be appealing and easily digestible. It it noted that it is not easy to predict how foods will taste in space; space food is also subject to engineering restrictions concerning its weight and compactibility, as well as its resistance to temperature and pressure changes, acceleration, and vibration. Packaging must protect and stabilize food for up to 30 days, as well as facilitiate meal preparation and disposal of leftovers. Typical space foods encompass rehydratable beverages and solids, together with irradiated, freeze-dried, and thermostabilized solids. Meal components are held onto trays by friction fit, and magnets keep the utensils from floating away. O.C.

N86-20638# Lone Star Army Ammunition Plant, Texarkana, Tex.
EVALUATION OF MATERIALS FOR THERMAL PROTECTION
J. I. MARTIN *In* Department of Defense Explosives Safety Board Minutes of the 21st Explosives Safety Seminar, Volume 2 p 1671-1687 Aug. 1984
(AD-P004901) Avail: NTIS HC A99/MF E03 CSCL 13L

An on-going program to provide improved thermal protection for pyrotechnic operators is described. The critical first step in providing improved personal protection is to insure that the best available materials is used to provide the outer shield. Researchers and manufacturers are continually introducing new materials, but they have not been tested against the special kind of thermal threat presented by pyrotechnics. A method of comparative testing of fabrics and other materials is described, and the results obtained with some of the latest available varieties of fabrics are discussed. Author (GRA)

N86-21146 Central Electricity Generating Board, London (England).
RADIOPROTECTION UPDATE
J. LECLERCQ 14 Nov. 1985 19 p Transl. into ENGLISH from Epure (France), no. 7, Jul. 1985 p 49-57
(BLL-CE-TRANS-8223-(9022-09)) Avail: British Library Lending Div., Boston Spa, Engl.

The problems involved in the radiation protection of nuclear power plant workers are illustrated. It is shown how and the safety of these workers, which is already ensured by the strict observance of public health requirements relating to occupational irradiation, can be improved by means of rational management. Radiation dosage, radiation distribution in the plants, reactor coolant chemistry, shutdown procedures, and nuclear fuels are among the topics discussed. R.J.F.

N86-21147*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MOBILE REMOTE MANIPULATOR VEHICLE SYSTEM Patent Application
H. G. BUSH, M. M. MIKULAS, JR., R. E. WALLSOM, and J. K. JENSEN, inventors (to NASA) 31 Jul. 1985 27 p
(NASA-CASE-LAR-13393-1; NAS 1.71:LAR-13393-1; US-PATENT-APPL-SN-760799) Avail: NTIS HC A03/MF A01 CSCL 05H

A mobile remote manipulator system is disclosed for assembly, repair and logistics transport on, around and about a space station square bay truss structure. The vehicle is supported by a square track arrangement supported by guide pins integral with the space station truss structure and located at each truss node. Propulsion is provided by a central push-pull drive mechanism that extends out from the vehicle one full structural bay over the truss and locks drive rods into the guide pins. The track switches allow the vehicle to travel in two (2) orthogonal directions over the truss structure which coupled with the bi-directional drive, allow movement in four (4) directions on one plane. The top layer of this tri-layered vehicle is a logistics platform. This platform is capable of 360 degrees of rotation and will have two (2) astronaut foot restraint platforms 18 and a space crane integral. NASA

N86-21148# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.
INSTRUMENT LIGHTING LEVELS AND AN/AVS-6 USAGE Final Report
W. M. SLUSHER Aug. 1985 48 p
(Contract AF PROJ. 718-4)
(AD-A161538; AAMRL-TR-85-055) Avail: NTIS HC A03/MF A01 CSCL 14B

Two experimental investigations were performed to determine the effects of the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS) display luminance on the setting of instrument lighting levels. In a laboratory study using a simulated A-10 night lighting mockup, eight subjects adjusted instrument lighting levels to what they judged to be the minimum required for safe readability of instruments. Prior to the adjustment of instrument lighting, the subjects were preadapted to various ambient lighting conditions, including a simulated ground luminance of a full moonlit night and two simulated ANVIS display luminances. Results show primary instrument lighting levels were set higher, by a factor of 1.6 following adaptation to the 1.0 foot lambert (ft-L) ANVIS luminance test condition when compared to lighting levels set following adaptation to a 0.00065 ft-L ambient luminance condition. GRA

N86-21149# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
HUMAN ENGINEERING GUIDELINES FOR THE EVALUATION AND ASSESSMENT OF VIDEO DISPLAY UNITS
W. E. GILMORE Jul. 1985 537 p
(TI85-016435; NUREG/CR-4227) Avail: NTIS HC A23/MF A01

The Nuclear Regulatory Commission is provided with a single source that documents known guidelines for conducting formal Human Factors evaluation of Video Display Units (VDUs). The handbook is a cookbook of acceptance guidelines for the reviewer faced with the task of evaluating VDUs already designed or planned for service in the control room. The areas addressed are video displays, controls, control/display integration, and workplace layout. Guidelines relevant to each of those areas are presented. The existance of supporting research is also indicated for each guideline. A Comment section and Method for Assessment section are provided for each set of guidelines. Author

N86-22112* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
DROP FOOT CORRECTIVE DEVICE Patent
B. C. DEIS, inventor (to NASA) 28 Jan. 1986 5 p Continuation of US-Patent-Appl-SN-876298, filed 9 Feb. 1978, abandoned
(NASA-CASE-LAR-12259-2; US-PATENT-4,566,447; US-PATENT-APPL-SN-280152; US-PATENT-CLASS-128-80-E)
Avail: US Patent and Trademark Office CSCL 05H

A light weight, economical device to alleviate a plurality of difficulties encountered in walking by a victim suffering from a drop foot condition is discussed. A legband girdles the leg below the knee and above the calf providing an anchor point for the upper end of a ligament having its lower end attached to a toe of a shoe or a toe on the foot. The ligament is of such length that the foot is supported thereby and retained in a normal position during walking.

Official Gazette of the U.S. Patent and Trademark Office

N86-22113*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DIRECT MODEL REFERENCE ADAPTIVE CONTROL OF A FLEXIBLE ROBOTIC MANIPULATOR
D. R. MELDRUM 15 Dec. 1985 90 p refs
(Contract NAS7-918)
(NASA-CR-176659; JPL-PUB-85-100; NAS 1.26:176659) Avail: NTIS HC A05/MF A01 CSCL 05H

Quick, precise control of a flexible manipulator in a space environment is essential for future Space Station repair and satellite servicing. Numerous control algorithms have proven successful in controlling rigid manipulators wih colocated sensors and actuators; however, few have been tested on a flexible manipulator with noncolocated sensors and actuators. In this thesis, a model reference adaptive control (MRAC) scheme based on command generator tracker theory is designed for a flexible manipulator. Quicker, more precise tracking results are expected over nonadaptive control laws for this MRAC approach. Equations of motion in modal coordinates are derived for a single-link, flexible manipulator with an actuator at the pinned-end and a sensor at the free end. An MRAC is designed with the objective of controlling the torquing actuator so that the tip position follows a trajectory that is prescribed by the reference model. An appealing feature of this direct MRAC law is that it allows the reference model to have fewer states than the plant itself. Direct adaptive control also adjusts the controller parameters directly with knowledge of only the plant output and input signals. Author

N86-22114*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
RECONFIGURABLE WORK STATION FOR A VIDEO DISPLAY UNIT AND KEYBOARD Patent Application
N. L. SHIELDS (Essex Corp.), M. F. FAGG (Essex Corp.), D. E. HENDERSON (Essex Corp.), and F. D. ROE, inventors (to NASA) 5 Dec. 1985 17 p
(NASA-CASE-MFS-26009-1SB; NAS 1.71:MFS-26009-1SB; US-PATENT-APPL-SN-805011) Avail: NTIS HC A02/MF A01 CSCL 05H

A reconfigurable workstation is illustrated having video, keyboard, and hand operated motion controller capabilities. The workstation includes main side panels between which a primary work panel is pivotally carried in a manner in which primary work panel may be adjusted and set in a negatively declined or positively inclined position for proper forearm support while operating hand controllers. A keyboard table supports a keyboard in such a manner that the keyboard is set in a positively inclined position with respect to the negatively declined work panel. Various adjustable devices are provided for adjusting the relative declinations and inclinations of the work panels, tables, and visual display panels. NASA

N86-22115# New Mexico State Univ., Las Cruces. Behavioral Engineering Lab.
A MULTIPLE-REGRESSION MODEL OF PILOT PERFORMANCE IN VERTICAL AND TRANSLATIONAL FLIGHT
J. WIEDEMANN and S. N. ROSCOE May 1985 102 p
(Contract N00014-81-K-0439)
(AD-A161364; BEL-85-2/ONR-85-2) Avail: NTIS HC A06/MF A01 CSCL 01D

An experiment was conducted to advance the development of a multiple regression model of VTOL pilot performance as a function of various control/display system and flight mission variables. Second-order response surfaces as a function of two control system design variables (translational control order and vertical control gain reduction factor) and three downward-looking display design variables (horizontal position error magnification, translational prediction time, and translational tracking mode) were derived from Pilot performances on each of three mission scenarios. The optimum values for each of the five system design variables were determined for each scenario independently using the same central composite experimental design with three groups of four subjects each. Comprehensive analyses of variance and canonical analyses were used to refine the fitted surfaces to determine the true nature of the pilot performance effects for each flight scenario and to select a single set of system design parameters that would yield near-optimum performances on all three scenarios. GRA

N86-22116# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
EVALUATION OF A PASSENGER MASK MODIFIED WITH A REBREATHER BAG FOR PROTECTION FROM SMOKE AND FUMES
E. A. HIGGINS, J. T. SALDIVAR, P. J. LYNE, and G. E. FUNKHOUSER Oct. 1985 25 p
(AD-A162473; DOT/FAA/AM-85-10) Avail: NTIS HC A02/MF A01 CSCL 06K

A series of experiments were conducted in an altitude chamber at ground level, 8,000 ft, 14,000 ft, and 21,500 ft, both with and without exercise, to evaluate the potential for providing protection from smoke and fumes for airline passengers while wearing a standard continuous-flow passenger mask modified by the addition of a rebreather bag. It was determined that it would provide increased protection for those individuals who had tidal volumes of 1.5 L or less. However, it would not function properly for those individuals who had tidal volumes greater than 1.5 L. Either the carbon dioxide levels were too great (above 15 mm Hg partial pressure) or the rebreather bag collapsed. These results indicate that the addition of the rebreather bag to the passenger mask has the potential for providing protection from smoke and fumes, but the system must have appropriately balanced valve resistances and appropriately sized valve openings. This critical balance has not yet been achieved for those individuals with large tidal volumes. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-26671
PHOTOMETRIC AND PHOTO ACOUSTIC MEASUREMENT OF THE ABSORBANCE OF MICRO-ORGANISMS AND ITS RELATION TO THE MICRO-ORGANISM-GRAIN HYPOTHESIS
S. YABUSHITA, K. WADA (Kyoto University, Japan), T. INAGAKI (Osaka Kyoiku University, Tennoji, Japan), and T. ITO (Tokyo, University, Japan) Astrophysics and Space Science (ISSN 0004-640X), vol. 117, no. 2, Dec. 1985, p. 401-406. refs

Absorption of E. Coli and other microorganisms are measured by standard optical spectroscopy and by the photoacoustic method. The former method does not yield an extinction peak at 220 nm

but yields a weak one at 270 nm, while with the latter method absorption peaks at 220 nm and a weaker one at 270 nm have been found for the spore of Bacillus subtilis. The well-known amino acid tryptophan shows absorption peaks at 220 and 280 nm. It is tentatively concluded that for the microorganism model of interstellar grains to be viable, they may have to be spores rather than ordinary cells. Author

A86-28721* Rensselaer Polytechnic Inst., Troy, N.Y.
PHOTOCHEMICAL REACTIONS IN INTERSTELLAR GRAINS PHOTOLYSIS OF CO, NH3, AND H2O
V. K. AGARWAL, J. P. FERRIS (Rensselaer Polytechnic Institute, Troy, NY), W. SCHUTTE, J. M. GREENBERG (Leiden, Rijksuniversiteit, Netherlands), R. BRIGGS (New York State, Dept. of Health, Albany) et al. Origins of Life (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 21-40. refs
(Contract NGR-33-018-148)

The interstellar grains are currently considered to be the basic building blocks of comets and, possibly, meteorites. To test this theory, a simulation of the organic layer accreted onto interstellar dust particles was prepared by slow deposition of a CO:NH3:H2O gas mixture on an Al block at 10 K, with concomitant irradiation with vacuum UV. The results of the HPLC and IR analyses of the nonvolatile residue formed by photolysis at 10 K are compared with those observed at 77 K and 298 K. Some of the compounds that may be present on the surfaces of interstellar dust particles have been identified, and some specific predictions concerning the types of molecular species present in comets could be drawn. The results also suggest that photochemical reactions may have been important for the formation of meteorite components. The implication of the findings to the questions of the source of organic matter on earth and the origin of life are discussed. Author

A86-28722
TRACE ELEMENTS IN CHEMICAL EVOLUTION. I. II - SYNTHESIS OF AMINO ACIDS UNDER SIMULATED PRIMITIVE EARTH CONDITIONS IN THE PRESENCE OF TRACE ELEMENTS
K. KOBAYASHI and C. PONNAMPERUMA (Maryland, University, College Park) Origins of Life (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 41-55, 57-67. refs

Studies concerned with the importance of trace elements in biochemical evolution are presented together with some new experimental evidence on the role of metals in the synthesis of biomolecules. The role of individual elements as either integral parts of the enzyme active centers, as the constituents of redox complexes, or as Lewis acids in enzymatic reactions is discussed. The reasons for the universal essentiality of Fe, Zn, Mo, and some other elements are seen in the combination of the relative abundance of these elements in the primeval ocean and their useful bioorganic characteristics. In an electric discharge experiment, the presence of trace metals was shown to significantly increase yields of complex amino acids (e.g., valine and glutamic acid) in the primordial-like atmosphere of CH4, NH3, and H2O, compared with the metal-less condition. The mechanism for this metal-effected promotion is seen in the first fixation of some organic compounds by Fe and Mo in a gas phase, thus facilitating their transfer into aqueous phase, where Zn may have catalyzed reactions in the water phase. I.S.

A86-28723* Alabama Univ., Birmingham.
RATIONALIZATION OF SOME GENETIC ANTICODONIC ASSIGNMENTS
J. C. LACEY, JR., L. M. HALL, and D. W. MULLINS, JR. (Alabama, University, Birmingham) Origins of Life (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 69-79. refs
(Contract NGR-01-010-001)

The hydrophobicity of most amino acids correlates well with that of their anticodon nucleotides, with Trp, Tyr, Ile, and Ser being the exceptions to this rule. Using previous data on hydrophobicity and binding constants, and new data on rates of esterification of polyadenylic acid with several N-acetylaminoacyl imidazolides, several of the anticodon assignments are rationalized. Chemical reasons are shown supporting the idea of the inclusion of the Ile in the catalog of biological amino acids late in the evolution, through a mutation of the existing tRNA and its aminoacyl-tRNA-synthetase. It was found that an addition of hexane increases the incorporation of hydrophobic Ac-Phe into poly-A, in support of the Fox (1965) and Oparin (1965) emphasis on the biogenetic importance of phase-separated systems. I.S.

A86-28724
LIMITS ON ASYMMETRIC ORTHOPOSITRONIUM FORMATION IN HIGH Z OPTICALLY ACTIVE MOLECULES
J. VAN HOUSE, A. RICH (Michigan, University, Ann Arbor), and P. W. ZITZEWITZ (Michigan, University, Dearborn) Origins of Life (ISSN 0302-1688), vol. 16, no. 1, 1985, p. 81-87. refs

New experimental results are presented for testing the Vester-Ulbricht (V-U) hypothesis, which states that the observed signs of biological chirality in the amino acids and sugars are caused by asymmetric radiolysis by beta particles. The experimental asymmetries, expressed in terms of A(Ps) values, created in amino acid samples by bombardment by a beam of low-energy positrons with a net helicity, were correlated with theoretically predicted values of A(Ps). The A(Ps) values for two high-Z amino acids, selenocystine and thyroxine, were found to be below the value of 0.0003, excluding the part of the theoretically predicted range of A(Ps). The experimental limit on the A(R) value, derived from the values of A(Ps), was found to be above 10 to the -9th, thirty times lower than a previous measurement in leucine (Z = 6), but still not small enough to rule out the V-U hypothesis. I.S.

N86-21150*# National Aeronautics and Space Administration, Washington, D.C.
PUBLICATIONS OF THE EXOBIOLOGY PROGRAM FOR 1984: A SPECIAL BIBLIOGRAPHY
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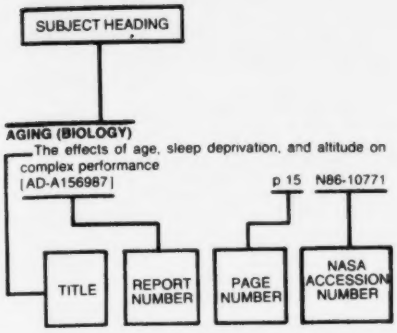
A bibliography of NASA exobiology programs is given. Planetary environments; chemical evolution; organic geochemistry; extraterrestrial intelligence; and the effect of planetary solar and astrophysical phenomena on the evolution of complex life in the universe are among the topics listed. R.J.F.

Typical Subject Index Listing



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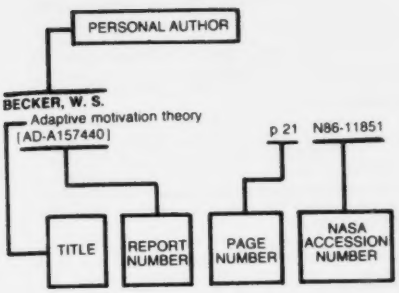

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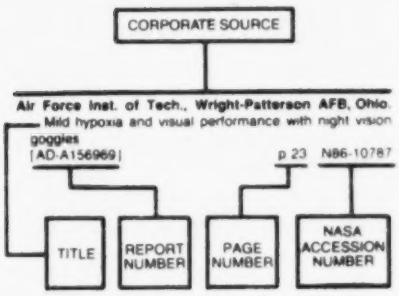

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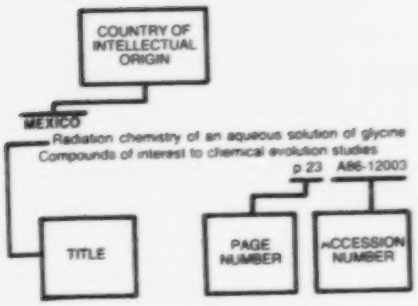

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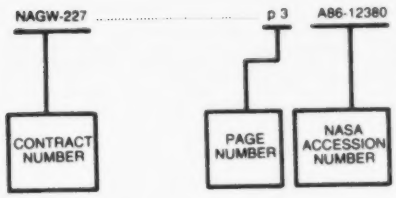

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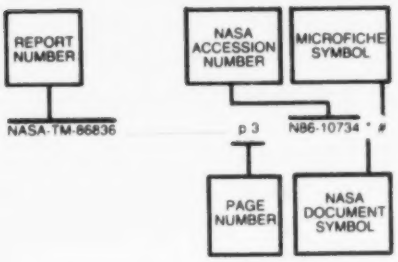

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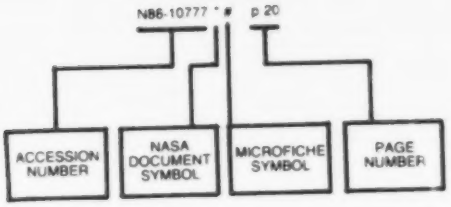

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Aerospace Medicine & Biology

Aerospace Medicine and Biology
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Pages 191–243
August 1986

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NASA SP-7011(287)

AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 287)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in July 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

NASA Scientific and Technical Information Branch 1986
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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 346 reports, articles and other documents announced during July 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes -- subject, personal author, corporate source, foreign technology, contract, report number, and accession number -- are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 54 Man/System Technology and Life Support 236
Includes human engineering; biotechnology; and space suits and protective clothing.

Category 55 Planetary Biology 243
Includes exobiology; and extraterrestrial life.

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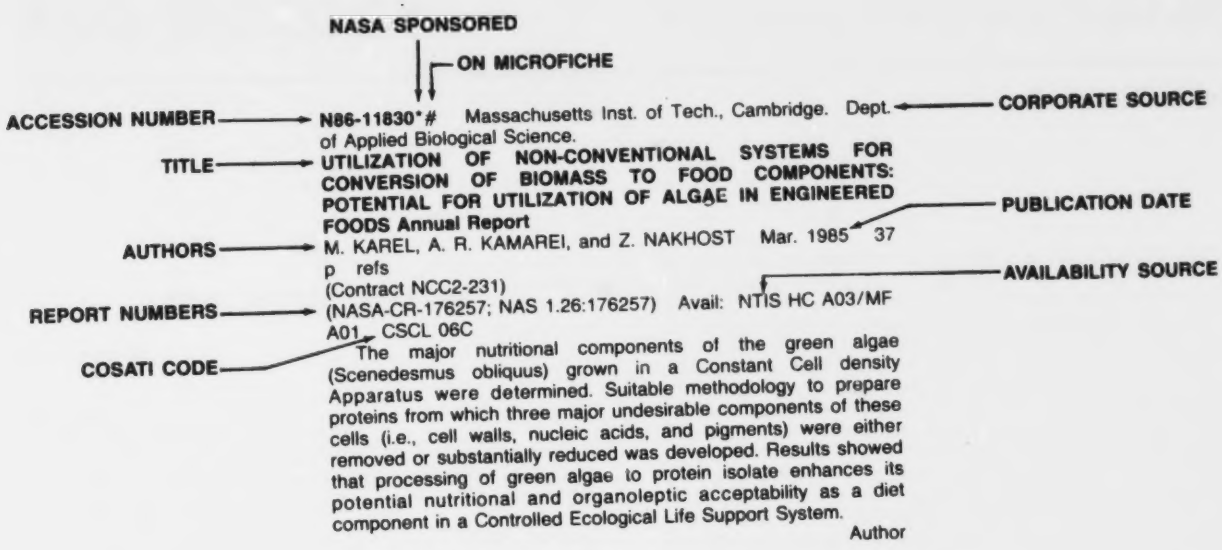
TYPICAL REPORT CITATION AND ABSTRACT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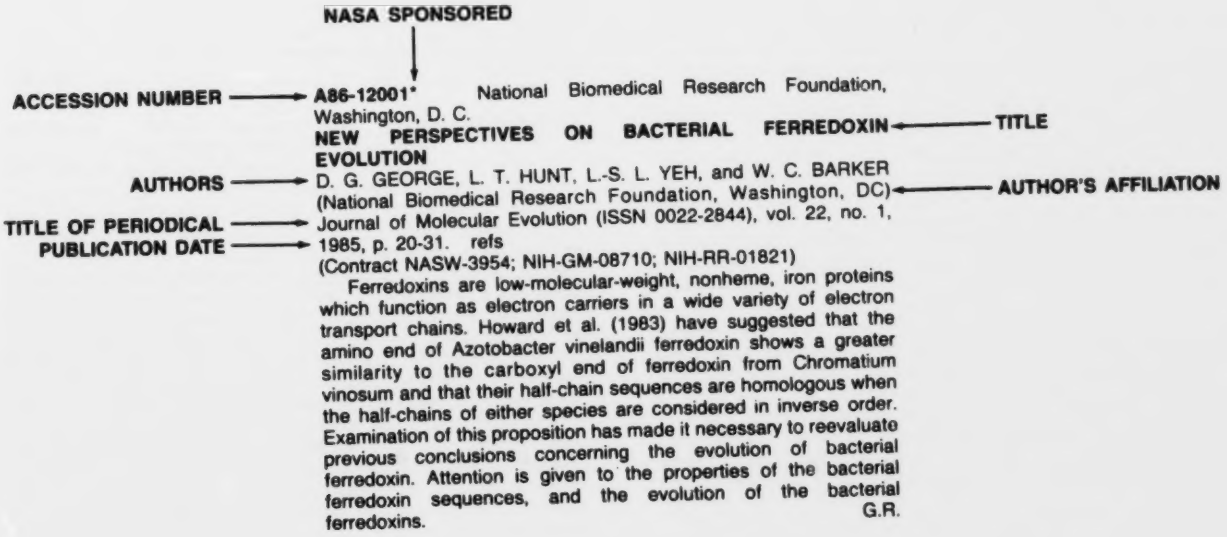
ACCESSION NUMBER
N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.
CORPORATE SOURCE
TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHORS
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
AVAILABILITY SOURCE
(Contract NCC2-231)
REPORT NUMBERS
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
COSATI CODE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT


NASA SPONSORED
ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
AUTHORS
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER
AUTHOR'S AFFILIATION
(National Biomedical Research Foundation, Washington, DC)
TITLE OF PERIODICAL
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1,
PUBLICATION DATE
1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 287)

AUGUST 1986

51

LIFE SCIENCES (GENERAL)

Includes genetics.

A86-30165
WHEAT FARMING IN A LUNAR BASE
F. B. SALISBURY and B. G. BUGBEE (Utah State University of Agriculture and Applied Science, Logan) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 635-645. refs

An analysis of the parameters involved in the efficient operation of a lunar based wheat farm is presented along with recommendations on this operation. Wheat, with its vertical leaf orientation and excellent growth under continuous light, has been studied in the context of a bioregenerative life support system. Theoretical photosynthetic efficiencies suggest a maximum dry matter yield of 195 g/sq m/day when plants are irradiated with 1000 micromol photons/s/sq m, an irradiance high-pressure sodium lamps can readily achieve. In practice, yields may be affected by the harvest index, biomass digestibility, and lamp efficiency. Based on these factors, each person requires a minimum of 6 sq m of growing area and 3.55 kW of electrical energy. However, based on currently achieved yields, these minimum figures are 24 sq m and 13.4 kW/person. If these numbers are then doubled to provide a safety margin, a lunar farm could theoretically support 100 people in a 5000 sq m area. In addition, yields may be increased by manipulating temperature, humidity, nutrients, carbon dioxide and radiation; and by breeding suitable cultivars K.K.

A86-30166* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METABOLIC SUPPORT FOR A LUNAR BASE
R. L. SAUER (NASA, Johnson Space Center, Houston, TX) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 647-651. refs

A review of the metabolic support systems used and the metabolic support requirements provided on past and current spaceflight programs is presented. This review will provide familiarization with unique constraints of space flight and technology as it relates to inflight metabolic support of astronauts. This information, along with a general review of the NASA effort to develop a Controlled Ecological Life Support System (CELSS) will define the general scenario of metabolic support for a lunar base. A phased program of metabolic support for a lunar base will be elucidated. Included will be discussion of the CELSS water reclamation and food recycling technology as it now exists and how it could be expected to be progressively incorporated into the lunar base. This transition would be from a relatively open system in the initial development period, when mechanical phase change water reclamation and minimal plant growth are incorporated, to the final period when practically total closure of the life support system will be proved through physicochemical and biological processes. Finally, a review of the estimated metabolic intake requirements for the occupants of a lunar base will be presented. Author

A86-30168
RADIATION TRANSPORT OF COSMIC RAY NUCLEI IN LUNAR MATERIAL AND RADIATION DOSES
R. SILBERBERG, C. H. TSAO, J. H. ADAMS, JR. (U.S. Navy, E. O. Hulburt Center for Space Research, Washington, DC), and J. R. LETAW (Severn Communications Corp., Severna Park, MD) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 663-669. refs

The radiation environment on the lunar surface is inhospitable. The permanent settlers may work ten hours per 24-hour interval for the two-week-long lunar day on the lunar surface, or 20 percent of the total time. At moderate depths below the lunar surface (less than 200 g/sq cm) the flux of secondary neutrons exceeds considerably that in the upper atmosphere of the earth, due to cosmic-ray interactions with lunar material. The annual dose equivalent due to neutrons is about 20 or 25 rem within the upper meter of the lunar surface. The dose equivalent due to gamma rays generated by nuclear interactions near the lunar surface is only on the order of 1 percent of that due to neutrons. However, gamma-ray line emission from excited nuclei and nuclear spallation products generated by cosmic rays near the lunar surface is of considerable interest: these lines permit the partial determination of lunar composition by gamma spectroscopy. Author

A86-30376
INTERNATIONAL UNION OF PHYSIOLOGICAL SCIENCES, COMMISSION ON GRAVITATIONAL, PHYSIOLOGY, ANNUAL MEETING, 7TH, NIAGARA FALLS, NY, OCTOBER 13-18, 1985, PROCEEDINGS
O. E. REYNOLDS, ED. Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, 257 p. For individual items see A86-30377 to A86-30480.

Among the topics discussed are: fluid/electrolyte balance and cardiovascular function in response to weightlessness; gravireception in plants and animals; and gravity sensitive systems in animals. Consideration is also given to: gravitational effects on animal development; chronobiology; the effect of gravity on cardiovascular fluid dynamics; and scientific payload concepts for the Space Station. Additional topics discussed include Spacelab bioscience mission results on homeostasis and biological rhythms in rats during spaceflight; the distribution of Ca, S, Mg, and P in rat incisors in space; and hematologic parameters of astrorats flown on Spacelab-3. I.H.

A86-30377#
COMPARATIVE ANALYSIS OF HYPO - AND HYPER-GRAVITY EFFECTS ON PRENATAL DEVELOPMENT OF MAMMALS
L. V. SEROVA, L. A. DENISOVA, and A. M. PUSTYNNIKOVA (Institut Mediro-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-5 to S-8. refs

The effects of hypergravity and microgravity on prenatal development in rats and mice is considered. Data from soviet space missions are compared to the results of ground based centrifugation experiments in order to study two types of physiological change associated with gravity effects: (1) nonspecific changes which develop as stress reactions; and specific changes which are related to alterations in the locations and function of

organs and tissues. The role of nonspecific and specific gravity effects in the process of copulation fertilization, and birth rate are considered detail. It is shown that the effects of microgravity and hypergravity (an adaptation period) appear to be almost the same. I.H.

A86-30378*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SPACEFLIGHT AND CALCIUM METABOLISM
E. R. MOREY-HOLTON and S. B. ARNAUD (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-9 to S-12. refs

Calcium metabolism data from spaceflight have been obtained primarily from Skylab astronauts, from Soviet Salyut-6 cosmonauts, and from growing rats flown either on the Soviet Cosmos series or Spacelab 3. In this report, the results from Skylab astronauts will be compared to data from bed rested subjects, and the results from Cosmos rats will be compared to data from a ground-based rat model, to help explain (1) how spaceflight or gravitational unloading alters calcium metabolism in adult humans and growing rats, (2) the relevance of the observations of bone dynamics in growing rats to the changes in adult man, and (3) the sequence of events leading to changes in calcium metabolism during spaceflight. A hypothetical scheme of the mechanisms causing altered bone mass during spaceflight will be proposed. Author

A86-30379*# Arizona Univ., Tucson.
RESPONSES OF SKELETAL MUSCLE TO UNLOADING - A REVIEW
M. E. TISCHLER, S. R. JASPERS, E. J. HENRIKSEN, and S. JACOB (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-13 to S-16. Previously announced in STAR as N85-35594. refs
(Contract NAGW-227; NIH-AM-28647)

Suspension models were used to study muscle response to reduced activity. During 6 days of tail casting, the soleus (SOL) atrophies while the extensor digitorum longus grows relatively normally. After discounting those changes in both muscles due primarily to increased secretion of adrenal hormones, the following conclusions regarding the specific responses of the SOL could be drawn: (1) Atrophy is probably due primarily to increased protein degradation; (2) Decreased synthesis of glutamine may result from reduced availability of ammonia due to diminished use of ATP; (3) Greater muscle glycogen seems to reflect an increased response to insulin of glucose uptake which leads to greater glucose metabolism; and (4) Faster catabolism of branched-chain amino acids can be attributed to enhanced flux through ketoacid dehydrogenase. Studies by others using tail casted suspended rats showed in the SOL: (1) a gradual switch from type 1 to type 2 fibers; (2) increased acid protease activity; and (3) altered muscle function and contractile duration. Using harness suspended rats, others showed in the SOL: (1) significant atrophy; (2) increased numbers of glucocorticoid receptors; and (3) no change in muscle fatigability. Author

A86-30380*# California Univ., Berkeley.
SKELETAL MASS CHANGE AS A FUNCTION OF GRAVITATIONAL LOADING
N. PACE, A. H. SMITH, and D. F. RAHLMANN (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-17 to S-20. refs
(Contract NSG-7336)

The hypothesis that increased loading on an animal by chronic centrifugation results in an increase in skeletal mass was tested, using metabolically mature hamsters, rats, guinea pigs, Dutch rabbits and New Zealand rabbits representing a body mass range from 0.15 to 3.8 kg. Groups of 12 male animals of each species were subjeted to 2.0 g for 6 weeks on a 2.74 radius centrifuge with one degree of freedom. Subsequently, six of the animals were killed to measure whole body composition, while the rest comprised the control group, recovering for four weeks at 1.0 g prior to composition analysis. Results show a significant increase in bone mineral mass at 2.0 g. These centrifuge experiment results were then compared with the results of the USSR Cosmos Biosatellite experiment, whereby five rats experienced osteoporosis after 18.5 days of weightlessness. The opposing nature of effects that occurred at 0 g and 2.0 g is indicated schematically of particular interest is the fact that the bone mineral mass of the Cosmos 1129 flight rats was 17 pct less than that of the 1.0 g controls; whereas the bone mineral mass of the centrifuge rats was 18 pct greater than that of their 1.0 g controls. It is concluded that the bone mineral mass of the rat is directly proportional to gravitational loading over the range of 0 g to 2.0 g. K.K.

A86-30388#
INVESTIGATIONS OF HIGHER PLANTS UNDER WEIGHTLESSNESS
A. J. MERKYS, R. S. LAURINAVICIUS, D. V. SVEGZDIENE, and A. V. JAROSIUS (AN LSSR, Institut Botaniki, Vilnius, Lithuanian SSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-43 to S-46.

During the last three decades a number of experiments on higher plants have been performed under spaceflight conditions in the USSR. They include radiobiological and genetical investigations of dormant seeds and microspores, physiological investigations of seed germination, and experiments on the prolonged growth of plants in space undergoing a full cycle of development with the formation of biologically valuable seeds. They also include experiments on the spatial orientation of plants under microgravity conditions and in the field of centrifugal forces that have made it possible to determine the threshold of geotropic sensitiveness of plants. On the basis of the level of knowledge obtained, key tasks for the longterm investigations of gravitational plant physiology in space are outlined. Author

A86-30389#
GRAVITY SENSING IN ANIMAL CELLS
A. COGOLI (Zuerich, Eidgenoessische Technische Hochschule, Zurich, Switzerland) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-47 to S-50. Research supported by the Swiss Federal Institutes of Technology. refs
(Contract SNSF-3,382,0,82)

Experimental results are reviewed concerning the sensitivity of animal cells to microgravity in space, low-gravity in a clinostat, and hypergravity in a centrifuge. Attention is given to the effects of low-g or micro-g environments on all phases of cell development and a variety of cell parameters including cell proliferation, motility, nuclear density, chromosome patterns, and morphology. Certain findings on the adaptation of human lymphocytes to microgravity may have practical applications to biotechnology. For example, the fact that lymphocytes increase their interferon production by reducing their proliferation rate may be common to other animals and could be exploited for in-vitro biosynthesis of pharmaceutical products. I.H.

A86-30390#
THE EFFECTS OF REAL AND SIMULATED MICROGRAVITY ON VESTIBULO-OCULOMOTOR INTERACTION
I. B. KOZLOVSKAIA, V. A. BARMIN, IU. V. KREIDICH, and A. A. REPIN (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-51 to S-56. refs

The effects of microgravity on the characteristics of the vestibulo-oculomotor interaction were studied on the basis of pre-flight and post-flight tests of rapid gaze fixation in 22 cosmonauts from the Salyut-6 and Salyut-7 spacecraft. The subjects performed a motor task involving rapid catching of a 1 deg luminous target which was presented on a white screen 30 cm from the eye. The amplitude and velocity of eye and head movements in the horizontal direction were monitored, and the timing of the task performance was analyzed. In general, the data are consistent with those of model simulations which predicted an increase in the 'invasiveness' of optokinetic stimuli and a decrease in eye-head coordination in microgravity. I.H.

A86-30391*# Michigan Univ., Ann Arbor.
VERTEBRATE GRAVITY SENSORS AS DYNAMIC SYSTEMS
M. D. ROSS (Michigan, University, Ann Arbor) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-57, S-58. refs
(Contract NAG2-325; NAS2-10535)

This paper considers verterbrate gravity receptors as dynamic sensors. That is, it is hypothesized that gravity is a constant force to which an acceleration-sensing system would readily adapt. Premises are considered in light of the presence of kinocilia on hair cells of vertebrate gravity sensors; differences in loading of the sensors among species; and of possible reduction in loading by inclusion of much organic material in otoconia. Moreover, organic-inorganic interfaces may confer a piezoelectric property upon otoconia, which increase the sensitivity of the sensory system to small accelerations. Comparisons with man-made accelerometers are briefly taken up. Author

A86-30392*# California Univ., Davis.
CHRONIC ACCELERATION AND EGG PRODUCTION IN DOMESTIC FOWL
A. H. SMITH, E. L. BESCH, and R. R. BURTON (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-59, S-60. refs
(Contract NR PROJECT 102-448; NSG-7493)

A study of the influence of chronic acceleration on egg production of commercially raised hens placed on a large animal centrifuge at 90 days of age, was performed. S8 generation hens were stepped up from 1.25 G to 2 G, which was maintained for 30 days. Fifty percent ceased to be in the laying condition at 1.5 G, and 10.8 percent suffered oviduct prolapse above 1.8 G. S21 generation hens had no incidents of oviduct prolapse despite 170-day retention at 2 G, and, assuming a 30 percent population not in the laying condition, approximated the commercial production rate. Chronic acceleration did not appear to affect the relative sizes of albumen or yolk, but it did appear to reduce the relative shell size, consistent with a decrease in plasma calcium. Dry matter content was not affected. R.R.

A86-30393#
ANIMAL MODELS OF MOTION SICKNESS - ARE NONEMETIC SPECIES AN APPROPRIATE CHOICE?
K.-P. OSSENKOPP and M. D. OSSENKOPP (Western Ontario, University, London, Canada) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-61, S-62. refs
(Contract NSERC-U-0151)

Indices of motion sickness (MS) in nonemetic species, with emphasis on the rat, are examined to determine whether these animals are appropriate choices for the study of MS. A body rotation-induced conditioned taste aversion experiment using guiñea pigs supports the generality of this phenomenon across a wide range of animal species, and demonstrates the utility of the conditioned taste aversion measure as an index of MS in nonemetic species. It is concluded that a multiindex approach, using several different indices, would provide a more phenomenally realistic method of describing and assessing MS. Easily quantifiable indices such as defecation levels during rotation, make the rata ideal for the study of the pharmacological treatment, and the neural mechanisms, of MS. R.R.

A86-30394#
EFFECTS OF NON WEIGHT BEARING ON CALLUS FORMATION
J. R. SWEENEY, H. E. GRUBER, M. E. KIRCHEN, and G. J. MARSHALL (Los Angeles Orthopaedic Hospital, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-63, S-64.

The inverted suspension cage of Morey (1981) is used to investigate the stages of callus formation and associated tissue repair in suspended rats. 9-11-month-old suspended and weight-bearing rats with fibular osteotomies were sacrificed at 9, 18, and 36 days, and fibulae were then processed for nondecalcified stained sections. A callus forms, but the size and progressive tissue formation are delayed, with dense irregular connective tissue remaining a prominent component until the 36th day. Chondrogenesis, osteogenesis, and the periosteal reaction and its accompanying neoangiogenesis are also delayed. Though the course of events in fracture healing of nonweight bearing rats is markedly delayed, may not be totally inhibited. R.R.

A86-30395#
CORRELATED LIGHT AND ELECTRON MICROSCOPY OF THE VASCULATURE OF CORTICAL BONE IN RAT FEMORA AND TIBIAE
R. M. DILLAMAN and R. D. ROER (North Carolina, University, Wilmington) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-65, S-66. refs

An approach is developed permitting an overall and focused evaluation of the relevant features of bone vasculature as they may apply to spaceflight osteoporosis. Tibiae and femora from rats, some of which had been injected with markers, are frozen and fractured, and bone pieces are then fixed and prepared for examination. Scanning and transmission electron microscopy revealed excellent preservation of ultrastructural features such as the osteocytic processes, and permitted vascular classification, and measurement of vessel diameter. Using brightfield and epifluorescence microscopy it was possible to describe the distribution of markers. Overall features were best revealed in stereoscopic examination. The overlap of analyses permits verification of measurement and relationships. R.R.

A86-30396#
EFFECTS OF GRAVITATIONAL AND MUSCULAR LOADING ON BONE FORMATION IN GROWING RATS
R. T. TURNER, B. W. SZUKALSKI (J. L. Pettis Memorial Veteran's Administration Hospital, Loma Linda, CA), and G. K. WAKLEY (Loma Linda University, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-67, S-68. Research supported by Loma Linda University and USVA. refs
(Contract NIH-AM-35651)

To determine the relative importance of muscular versus gravitational loading on bone structure, bone formation was measured in tibial cross-sections from rats subjected to orbital space flight. This was compared with bone formation in rats whose muscular loading of the tibia was reduced by sciatic nerve section and with rats whose dynamic gravitational loading of the tibia was reduced by pelvic suspension. Our results show that (a) all three treatments inhibit bone formation; (b) inhibition of bone formation is site-specific in the tibia and, (c) inhibition of bone formation is characteristic of the treatment applied. Author

A86-30397#
ARE THERE CONDITIONS IN WHICH ADRENALECTOMY IMPEDES THE ATROPHYING EFFECTS OF DENERVATION?
R. R. ALMON and D. C. DUBOIS (New York, State University, Buffalo) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-69, S-70.

The results of previous work from this and other laboratories suggest the possibility that the atrophy of skeletal muscle may involve the muscle becoming hypersensitive to glucocorticoids. If this hypothesis is correct, then a possible test would be to remove the source of the hormone and such atrophy should not occur. The objective of this study was to evaluate the effects of diet on denervation atrophy in normal and adrenalectomized animals. The variations in diet ranged from a high-calorie liquid diet to starvation. The results clearly show that when the demand for amino acid carbon from the musculature is increased due to starvation, adrenalectomy protects the musculature from both starvation atrophy and denervation atrophy. In addition, we found that adrenalectomy does not entirely remove corticosterone from the animals. Stress will induce the presence of corticosterone in the serum of adrenalectomized animals. Author

A86-30398#
MODIFICATION OF THE RESTING OXYGEN CONSUMPTION LEVEL OF BIOLOGICAL BODY AND ITS TISSUES, DURING PROLONGED HYPODYNAMICS EXPOSURE
H. SAIKI (St. Marianna University, Japan), Y. SAIKI (Saiki Institute, Japan), M. SUDOH, M. NAKAYA, K. SHIODA (Jikei University, Tokyo, Japan) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-73, S-74.

Human and animal experiments were performed to clarify whether it is possible to decrease the basal metabolic rate of the whole body and of the tissue cells by hypodynamic orthostatic conditioning. The daytime resting metabolic rates (RMR) of human subjects during six days of water immersion conditioning were analyzed to estimate the circadian rhythm. Similar analysis with rats undergoing 3-10 weeks of orthostatic suspensioh conditioning was performed, with some groups killed at days eight and 20 to measure tissue oxygen consumption. Daily average RMR values did not deviate over the testing periods, and though a gradual deformation of RMR curves was seen, they returned to baseline by the end of the periods. It is concluded that it is difficult to produce basal metabolic rate reduction during such conditioning durations. R.R.

A86-30399*# Columbia Univ., New York.
EARLY MAMMALIAN DEVELOPMENT UNDER CONDITIONS OF REORIENTATION RELATIVE TO THE GRAVITY VECTOR
D. J. WOLGEMUTH and G. S. GRILLS (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-75, S-76.
(Contract NAG2-324)

A clinostat was used to assess the effects of reorientation relative to the gravity vector on mammalian germ cells cultured in vitro. Previous studies using this system revealed an inhibition of meiotic maturation of mouse oocytes. In the present study, the effects of clinostat rotation on in vitro fertilization were examined. The frequency of fertilization of experimental cultures did not vary from that of the clinostat vertical control cultures at either of the rotation rates examined. Importantly, no abnormalities of fertilization, such as parthenogenetic activation, fragmentation, or polyspermy were seen. It is concluded that the initial events of fertilization were unaffected by this treatment, although the developmental potential of these embryos remains to be assessed. Author

A86-30400*# Texas Univ., Houston.
GROWTH AND DIFFERENTIATION OF MAMMALIAN EMBRYONIC TISSUES EXPOSED TO HYPERGRAVITY IN VIVO AND IN VITRO
J. DUKE, L. JANER, and J. MOORE (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-77, S-78. refs
(Contract NAG2-332)

Decreased cartilage areas in embryonic limbs developing under excess g in vitro, is reported, as well as delayed skeletal development in embryos and fetuses exposed to excess g in utero. 12.5-day mouse limb buds were cultured at 2.6 g, and fixed at two days and six days of culture. In vivo experiments used alizarin-stained 18-day fetuses exposed to 2.3 g. In all studies, cartilage areas were determined using a digitized tablet. Form factor analysis determined that the main effect of in vitro centrifugation was a reduction in length of the limb elements, probably due to the precocious chondrogenesis seen in the upper regions of centrifuged limbs. Similar reductions in length of ossified areas was seen in the in utero studies. R.R.

A86-30401*# Arizona Univ., Tucson.
SIMULATED HYPOGRAVITY AND SYNAPTOGENESIS IN CULTURE
R. GRUENER (Arizona, University, Tucson; Maryland, University, Baltimore) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-79, S-80. refs
(Contract NAG2-326; NIH-NS-07702)

A study on the effects of simulated microgravity on spinal neurons and myocytes cultured from X. laevis, is performed. Horizontal clinorotation at 1-10 rpm lasted from 16-36 hours, a sufficient time for cells to proceed through ontogenetic maturation. Late appearance of striations, retarded consumpton of yolk platelets and fewer and thinner neurites indicate subnormal expression of cell functions. Furthermore, these cells do not respond normally to environmental cues like trophic substances or surface contact. The observed delay in cell maturation is consistent with a hypothesis that cellular graviperception may effect the centriole and cytoskeleton. R.R.

A86-30402#
EARLY POSTNATAL DEVELOPMENT OF RATS GESTATED DURING FLIGHT OF COSMOS 1514
J. R. ALBERTS (Indiana University, Bloomington), L. V. SEROVA, Z. APANASENKO (Institut Mediko-Biologicheskikh Problem, Moscow, USSR), and J. R. KEEFE (Case Western Reserve University, Cleveland, OH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-81, S-82. refs

The role of gravity in mammalian ontogenesis is examined. The delivery and development of pups in rats exposed to 5 days of zero gravity on Cosmos 1514, in control rats exposed to identical conditions as the flight group except under gravity, and in viviarium control rats are studied. The data reveal that all the rats delivered their litters at the standard gestation age, the flight rats had a mortality of 19 percent, the control rats morbidity was insignificant, and all the rats displayed typical maternal care cycles and nest attendance patterns. The mean body weights for the pups one day after birth are measured as 6.25 gm for the flight pups, 6.02 gm in the synchronous control group, and 7.06 gm in the vivarium rats. It is observed that fur development and eye opening in all three groups is equivalent. The vestibular and factory functions, and tactile, auditory, and visual sensitivity are evaluated and similar responses are detected in all pups. I.F.

A86-30403*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GROWTH AND DEVELOPMENT OF MICE AND RATS CONCEIVED AND REARED AT DIFFERENT G-INTENSITIES DURING CHRONIC CENTRIFUGATION
J. OYAMA, L. SOLGAARD, J. CORRALES, and C. B. MONSON (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-83, S-84. refs

Prenatal and postnatal growth of rats conceived and reared at different G-intensities from 1.0G (earth gravity) to a maximum of 2.03G were compared. Prenatal growth was not generally impaired but the lung/body mass ratio of 22-day old fetuses at 2.03G was decreased significantly compared to 1.06 controls. Survival of neonatal rats was substantially reduced at 1.71G and 2.03G. Postnatal growth was decreased at the higher G-intensities and showed smaller or no effects at the lower G-intensities. Comparisons of organ/body mass ratios of hyper-G and 1.0G rats at 9 wks of age showed relatively few differences at the lower G-intensities. Postnatal growth of mice at 2.03G was suppressed during the neonatal period but recovered later so that after 9 wks the body mass of females reached and of males approached controls. Results of this preliminary study clearly show the influence of body mass in scaling the effects of hyper-G on the growth and development of and between different animal species. Author

A86-30404*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A MARSUPIAL MODEL FOR THE INVESTIGATION OF GRAVITATIONAL EFFECTS ON EARLY DEVELOPMENT
W. JURGELSKI and K. A. SOUZA (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-85, S-86. refs

The application of the marsupial mouse to the study of gravitational effects on early development is discussed. The benefits provided to microgravity experiments by the unique development of the species are described. The uterogestation and exterogestation, and the formation of the vestibular and musculoskeletal systems in the marsupial mouse are examined. I.F.

A86-30405*# Baylor Coll. of Medicine, Houston, Tex.
MORPHOGENESIS AND CALCIFICATION OF THE STATOCONIA IN THE CHICK (GALLUS DOMESTICUS) EMBRYO - IMPLICATIONS FOR FUTURE STUDIES
C. D. FERMIN and M. IGARASHI (Baylor College of Medicine, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-87, S-88. refs
(Contract NAG2-342; PHS-RR-05425; NIH-NS-10940; NIH-NS-22604)

The morphogenesis of the statoconia in the chick, Gallus domesticus, injected with a carbon anhydrase inhibitor is studied. The preparation of the embryo specimens for analysis is described. The early, middle, and late stages of embryonic development are examined. The data reveal that acetozolamide inhibits statoconia formation in the middle stage of development and the calcification process follows statoconia formation. The spatial relationship between the development of type 1 and type 2 hair cells and the appearance and maturation of the statoconia is investigated. I.F.

A86-30406*# Florida State Univ., Tallahassee.
FERTILIZATION, DEVELOPMENT AND SPICULE FORMATION IN SEA URCHINS UNDER CONDITIONS OF CONSTANT REORIENTATION RELATIVE TO THE GRAVITATION AXIS
G. SCHATTEN, C. STROUD, C. SIMERLY, and H. SCHATTEN (Florida State University, Tallahassee) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-89, S-90. refs
(Contract NAG2-340)

A86-30407*# Indiana Univ., Bloomington.
RESPONSE OF AMPHIBIAN EGG NON-YOLK CYTOPLASM TO GRAVITY ORIENTATION
R. C. SMITH, A. W. NEFF, and G. M. MALACINSKI (Indiana University, Bloomington) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-91, S-92. refs
(Contract NAG2-323)

In order to study amphibian egg cytoplasmic organization and egg symmetrization at the molecular level, a library of seventeen monoclonal antibodies (MoAbs) against Xenopus laevis non-yolk egg proteins was produced. Several of these MoAbs react with non-yolk cytoplasmic antigens which are unevenly distributed in the fertile Xenopus egg. Author

A86-30408*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AMPHIBIAN FERTILIZATION AND DEVELOPMENT IN MICROGRAVITY
K. A. SOUZA (NASA, Ames Research Center, Moffett Field, CA) and S. D. BLACK (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-93, S-94. refs

An experiment investigating the effects of gravity on embryonic development in amphibians is proposed. The planned procedures for the preparation of the frog eggs for launching in the Space Shuttle, for the injection of the eggs with gonadotropin, for the insertion of the eggs into egg chambers, for the storage of one of the chambers in a microgravity area and the second into a centrifuge, and for the fertilization of the eggs are described. The later organogenesis, swimming behavior, cytoplasmic components, cellular formation, neural plate and archenteron expansion, and allometry and expansion of the organ systems will be examined. Normal morphology for embryos and tadpoles developing at microgravity and the formation of the neural plate opposite the sperm entry point meridian are predicted. I.F.

A86-30409#
EVIDENCES FOR CHANGES IN SENSITIVITY TO AUXIN AND IN CELL-WALL PROPERTIES DURING GRAVITROPIC BENDING OF DICOT STEMS
F. B. SALISBURY, P. A. RORABAUGH, and R. WHITE (Utah State University of Agriculture and Applied Science, Logan) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-95, S-96. refs

A86-30410#
EFFECTS OF SIMULATED GRAVITY NULLIFICATION ON SHOOT-INVERSION RELEASE OF APICAL DOMINANCE IN PHARBITIS NIL
M. G. CLINE and T. K. PRASAD (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-97, S-98.

Inversion of upper shoot of Pharbitis nil induces outgrowth of the highest lateral bud adjacent to bend in stem. The objectives of this study are to determine whether simulated gravity nullification will (1) decrease ethylene production and 1-aminocyclopropane-1-carboxylic acid (ACC) synthase activity in inverted shoot, (2) restrict growth in inverted shoot and (3) affect outgrowth of highest lateral bud. Gravity nullification is simulated by rotating the plant (with its upper shoot inverted) in a vertical plane perpendicular to axis of a horizontal clinostat. Results indicate that clinostating does: (1) prevent release of apical dominance, (2) significantly decrease ACC synthase activity and ethylene production in inverted shoot and (3) reduce growth restriction of inverted shoot. These data are consistent with hypothesis that shoot inversion release of apical dominance is caused by ethylene-induced restriction of growth in inverted shoot. Author

A86-30411*# Cornell Univ., Ithaca, N.Y.
GRAVISTIMULATION-INDUCED CHANGES IN CURRENT PATTERNS AROUND ROOT CAPS
T. BJORKMAN and A. C. LEOPOLD (Cornell University, Ithaca, NY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-99, S-100. refs
(Contract NIH-P41-RR-01395-SSS; NAGW-3)

Changes in the electric current patterns around the root cap of corn following gravistimulation were determined using a vibrating probe. A transient increase in upward current in the cap was found following stimulation. The response began with a time lag similar to the presentation time, and was limited to the area of the root cap lateral to the statocytes. A pysiological response as rapid as that reported by Behrens et al. (1985) was not observed. C.D.

A86-30412*# Kenyon Coll., Gambier, Ohio.
EFFECT OF CALMODULIN AND AUXIN TRANSPORT INHIBITORS ON CALCIUM NET UPTAKE ALONG APICAL CORN ROOTS
K. L. EDWARDS (Kenyon College, Gambier, OH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-101, S-102. refs
(Contract NAGW-368)

A86-30413*# Washington Univ., St. Louis, Mo.
RED LIGHT SHIFTS THE LOCUS AND RATE OF GRAVITROPIC CURVATURE IN ETIOLATE PEA EPICOTYLS
M. A. HARRISON and B. G. PICKARD (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-103, S-104.
(Contract NAGW-70; NAGW-420)

A86-30414*# Ohio State Univ., Columbus.
THE STRUCTURE AND DEVELOPMENT OF THE STARCH SHEATH IN PEA EPICOTYLS
D. F. SACK (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-105, S-106. refs
(Contract NAGW-780)

Graviperception in plant stems is thought to occur in endodermal cells differentiated as a starch sheath, but little is known about the ultrastructure of these cells in dicots. The structure of the pea starch sheath was studied with respect to gravity and to development in order to determine whether symplastic or apoplastic blockages exist and to describe any intracellular polarity. Amyloplasts increase in size towards the base of the epicotyl hook but are not consistently sedimented until the cells enter the zone exhibiting gravicurvature below the hook. The starch sheath cells are connected to each other and to cells of the cortex and the stele by plasmodesmata. A casparian strip exists in older endodermal cells but not at the stage that the endodermis is differentiated as a starch sheath. Amyloplasts were frequently observed in apparent contact with endoplasmic reticulum. Author

A86-30415#
PLANT GROWTH RESPONSES TO ATMOSPHERE AND OTHER ENVIRONMENTAL VARIABLES IN THE SPACE SHUTTLE PLANT GROWTH UNIT
M. D. CUELLAR and C. A. MITCHELL (Purdue University, West Lafayette, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-107, S-108.

Studies using a ground-based version of the Plant Growth Unit (PGU) are being conducted with mungbean (Phaseolus aureus Rosb. cv. Berken). Composition and turnover rate of atmosphere within four Plant Growth Chambers (PGCs) mounted in the PGU were investigated. Addition of Hoagland's No. 1 nutrient solution to the medium resulted in superior seedling growth over that using only water. Flowing atmosphere at 1 liter/h through the PGCs for 7 days had no significant effect on shoot dry weight relative to that in a static atmosphere, but did result in greater stem length. In a static atmosphere, ethylene accumulated to levels which retarded plant growth, as demonstrated using a technique designed to trap C2H4 over 7-day growth periods. Elevated levels of CO2 also accumulated in sealed PGCs lacking C2H4 traps, but a depletion of CO2 occurred when using such traps, while plants exhibited increased growth. Author

A86-30416#
EFFECTS OF MECHANICAL STRESSES, ABSCISIC ACID, AND OUTDOOR EXPOSURE ON GROWTH AND WATER RELATIONS OF EGGPLANT
J. G. LATIMER and C. A. MITCHELL (Purdue University, West Lafayette, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-109, S-110. refs

A86-30417*# Michigan State Univ., East Lansing.
AN ATTEMPT TO LOCALIZE AND IDENTIFY THE GRAVITY SENSING MECHANISM OF PLANTS
R. S. BANDURSKI, A. SCHULZE, and D. REINECKE (Michigan State University, East Lansing) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-111, S-112. refs
(Contract NAGW-97; NSF PCM-82-04017)

The oxidation and transport of indole-3-acetic acid (IAA) in Zea mays is examined towards an understanding of the gravity-influenced promotion of growth in plants. An enzyme that oxidizes IAA to a nongrowth-promoting species has been partially purified, and determined to be stimulated by a lipoidal factor. Data suggest that the upward transport of IAA in the stele and outward movement from the stele into the mesophyll cortex is metabolically mediated, and possibly affected by the gravitational stimulus. It is postulated that hormone assymmetries can arise by 'potential-gating' of the transport channels between the various plant tissues. R.R.

A86-30418*# Baylor Univ., Waco, Tex.
CYTOCHEMICAL LOCALIZATION OF CALCIUM IN CAP CELLS OF PRIMARY ROOTS OF ZEA MAYS L
R. MOORE (Baylor University, Waco, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-113, S-114. NASA-supported research.

The cellular distribution of Ca in caps of primary roots of Zea mays was examined during the onset and early stages of gravicurvature to determine its possible role in root gravitropism. Staining becomes associated with the portion of the cell wall adjacent to the distal end of the cell after five minutes, and persists throughout the onset of gravicurvature. The outermost peripheral cells of roots oriented horizontally and vertically secrete Ca through plasmodesmata-like channels in their cell walls. Data suggest that Ca is not transported laterally through the columella tissue,but rather that the movement of Ca to the lower side of caps of horizontally-oriented roots is at least partially through and/or on the mucilage of the cap, and via an electrochemical gradient. An important role in root gravitropism is indicated for Ca secretion by peripheral cells. R.R.

A86-30419*# Texas Univ., Austin.
IMMUNOCYTOCHEMICAL LOCALIZATION OF CALMODULIN IN PEA ROOT CAPS AND PLUMULES AND ITS RELEVANCE TO HYPOTHESIS ON GRAVITROPISM
S. J. ROUX and M. DAUWALDER (Texas, University, Austin) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-115, S-116.
(Contract NSG-7480)

A86-30420*# California Univ., Berkeley.
EFFECTS OF NORFLURAZON ON THE LEVELS OF ABSCISIC ACID AND XANTHOXIN IN CAPS OF GRAVISTIMULATED ROOTS OF MAIZE
L. J. FELDMAN (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-117, S-118. refs
(Contract NAGW-238)

A86-30421#
THE CALCIUM DEPENDENCE OF AUXIN ACTION IN ROOTS
M. L. EVANS and K.-H. HASENSTEIN (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-119, S-120. refs

The inhibitory action of auxin on growth in roots of maize seedlings raised to contain variable levels of calcium is studied to investigate the interaction of calcium and auxin in the control of root elongation. Inhibition of root elongation by 10 micro-M of Indole-3-acetic acid (IAA) does not occur in roots of seedlings raised by inhibition and growth in distilled water to minimize their calcium content. The inhibition of root growth by 0.01 micro-M IAA resembles that of 0.5 mM CaCl2. These results are consistent with the suggestion that IAA action is coupled to IAA-induced calcium release from storage pools. The calcium-control hypothesis has application to microgravity studies, where gravity-induced calcium redistribution could establish a gradient in auxin activity without a gradient in auxin concentration. R.R.

A86-30422#
CORRELATED CHANGES IN CALMODULIN ACTIVITY AND GRAVITROPIC SENSITIVITY IN ROOTS OF MAIZE
C. L. STINEMETZ and M. L. EVANS (Ohio State University, Columbus) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-121, S-122. refs

A86-30423*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
BONE LOSS DURING SIMULATED WEIGHTLESSNESS - IS IT GLUCOCORTICOID MEDIATED?
D. D. BIKLE, B. P. HALLORAN, C. M. CONE, and E. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field; USVA, Medical Center, San Francisco, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-123, S-124.

Elevating the hindquarters of a rat by the tail unweights the hind limbs but maintains normal weight-bearing by the forelimbs. This maneuver leads to a decrease in bone mass and calcium content in the unweighted bones (e.g., tibia and L1 vertebra), but not in the normally weighted bones (e.g., humerus and mandible). Potentially, the stress of the maneuver, mediated by increased glucocorticoid production and secretion, could explain the decreased bone formation, rather than the skeletal unweighting per se. To test this possibility, the effects of adrenalectomy on the response of bone to the unweighting of the hind limbs of normal rats were evaluated. Author

A86-30424*# Columbia Univ., New York.
LOCALIZATION OF CALCIUM STIMULATED ADENOSINE TRIPHOSPHATASE ACTIVITY IN BLOOD VESSELS OF THE SKELETON
S. B. DOTY (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-125, S-126. refs
(Contract NCC2-325)

Alkaline phosphatase is an enzyme found in bone forming cells which decreases in certain bones as a result of hypogravity or non-weight bearing. This enzyme can also hydrolyze adenosine triphosphate. Therefore, an effort was made to localize calcium-stimulated ATPase by cytochemistry to determine whether altered bone cell activity might be related to changing calcium levels which occur during hypogravity. The results indicate that Ca(++)-ATPase is largely found along the endothelium and basal lamina of blood vessels, and not found in bone forming cells. This suggests that calcium regulation in the vicinity of bone

formation may be modulated by the vasculature of the area.
Author

A86-30425*# California Univ., San Francisco.
EFFECT OF SIMULATED WEIGHTLESSNESS AND CHRONIC 1,25-DIHYDROXYVITAMIN D ADMINISTRATION ON BONE METABOLISM
B. P. HALLORAN, D. D. BIKLE, R. K. GLOBUS, M. J. LEVENS (California, University, San Francisco), T. J. WRONSKI (Florida, University, Gainesville), E. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-127, S-128.

Weightlessness, as experienced during space flight, and simulated weightlessness induce osteopenia. Using the suspended rat model to simulate weightlessness, a reduction in total tibia Ca and bone formation rate at the tibiofibular junction as well as an inhibition of Ca-45 and H-3-proline uptake by bone within 5-7 days of skeletal unloading was observed. Between days 7 and 15 of unloading, uptake of Ca-45 and H-3-proline, and bone formation rate return to normal, although total bone Ca remains abnormally low. To examine the relationship between these characteristic changes in bone metabolism induced by skeletal unloading and vitamin D metabolism, the serum concentrations of 25-hydroxyvitamin D (25-OH-D), 24, 25-dihydroxyvitamin D (24,25(OH)2D) and 1,25-dihydroxyvitamin D (1,25(OH)2D) at various times after skeletal unloading were measured. The effect of chronic infusion of 1,25(OH)2D3 on the bone changes associated with unloading was also determined.
Author

A86-30426*# Arizona Univ., Tucson.
RESPONSE OF RAT HINDLIMB MUSCLES TO 12 HOURS RECOVERY FROM TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, P. COOK, and S. JASPERS (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-129, S-130. Previously announced in STAR as N85-35590. refs
(Contract NAGW-227)

Previous work has shown a number of biochemical changes which accompany atrophy or reduced muscle growth in hindlimb of tail-casted, suspended rats. These results clearly show that altered muscle growth was due to changes in protein turnover. Accordingly, the rise in soleus tyrosine following unloading reflects the more negative protein balance. Other major changes we found included slower synthesis of glutamine as indicated by lower ratios of glutamine/glutamate and reduced levels of aspartate which coincide with slower aspartate and ammonia metabolism in vitro. In conjunction with the study of SL-3 rats, which were subjected to 12 h of post-flight gravity, a study of the effects of 12 h eight bearing on metabolism of 6-day unloaded hindlimb muscles was carried out.
G.L.C.

A86-30427*# Arizona Univ., Tucson.
POSSIBLE MECHANISM FOR CHANGES IN GLYCOGEN METABOLISM IN UNLOADED SOLEUS MUSCLE
E. J. HENRIKSEN and M. E. TISCHLER (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-131, S-132. Previously announced in STAR as N85-35588. refs
(Contract NAGW-227)

Carbohydrate metabolism has been shown to be affected in a number of ways by different models of hypokinesia. In vivo glycogen levels in the soleus muscle are known to be increased by short-term denervation and harness suspension. In addition, exposure to 7 days of hypogravity also caused a dramatic increase in glycogen concentration in this muscle. The biochemical alterations caused by unloading that may bring about these increases in glycogen storage in the soleus were sought.
G.L.C.

A86-30428*# Vanderbilt Univ., Nashville, Tenn.
CHANGES IN SKELETAL MUSCLE PROPERTIES FOLLOWING HINDLIMB SUSPENSION
G. T. PATTERSON and W.-D. DETTBARN (Vanderbilt University, Nashville, TN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-133, S-134.
(Contract NAG2-301)

Changes in AChE regulation, the functions of the sarcoplasmic reticulum (SR), and muscle fiber-type population in the extensor digitorium longus (EDL) and soleus of male rats suspended in a nonweight-bearing position are studied. Muscle weight, AChE activity, protein content, SR calcium loading rates, and muscle types in the suspended and control rats are evaluated and compared. It is observed that following 1-4 weeks of suspension the EDL is unaffected; however, the soleus muscle weight, and protein content decrease and the AChE activity increases. The SR calcium loading rates of EDL decrease 10 percent and the soleus increase 50 percent in the suspended rats. The data reveal that the population of muscle type 1 (slow fibers) decreases and type 2 (fast fibers) increases for the soleus, and the distribution is unchanged for the EDL of the suspended rats. It is detected that a nonweight-bearing position affects the soleus (a fast-twitch muscle), but not the EDL (a slow-twitch muscle).
I.F.

A86-30429*# Texas Univ., Dallas.
CONTROL OF ARACHIDONIC ACID RELEASE IN CHICK MUSCLE CULTURES
G. H. TEMPLETON, M. PADALINO, and W. WRIGHT (Texas, University, Dallas) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-135, S-136. refs
(Contract NAGW-140)

Cultures from thigh muscles of 12 day old embryonic chicks are utilized to examine arachidonic release, prostaglandin (PG) biosynthesis, and protein synthesis. The preparation of the cultures is described. It is observed that exogenous arachidonic acid is formed into photsphatidylethanolamine and phosphatidylcholine, is released by a calcium ionosphere or phospholiphase simulator, and is the substrate for the biosynthesis of PG; the epidermal growth factor and PGF do not stimulate protein synthesis over the basal levels. The relationship between arachidonate release and melittin is studied. The data reveal that a change in intracellular calcium stimulates phospholiphase activity, arachidonate release, and PG synthesis in chick muscle culture.
I.F.

A86-30430#
CAGE-SIZE AND GENDER EFFECTS ON FATIGUE IN RATS
R. M. ENOKA, L. L. RANKIN, and D. G. STUART (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-137, S-138. refs

The effects of cage size during rearing and of gender on the physiological properties of adult rat muscles are investigated. Male and female rats were housed in cages 47 x 25 x 20 cm and 320 x 183 x 99 cm and separated by gender. The size, and contractile and electromyographic (EMG) characteristics of the soleus and extensor digitorin longus (EDL) of the caged rats are evaluated. It is observed that the soleus and EDL of the males are 0.23 g and 0.25 g respectively, and both muscles are 0.17 g in the females; the force exerted by the EDL in response to stimuli is 2.13 N in the males and 1.29 N in the females. It is noted that cage size and gender have minimal effects on changes in the EMG characteristics, gender influences whole body mass, and absolute force, and cage size and gender affect normalized force and fatigability.
I.F.

A86-30431#
ALTERED CARBOHYDRATE METABOLISM IN THE WHOLE BODY SUSPENDED RAT
J. M. STEFFEN, R. D. FELL, and X. J. MUSACCHIA (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-139, S-140. refs

Adjustments to seven days of hypokinesia/hypodynamia (H/H) in suspended rats include increased muscle fatigability and decreased oxidative capacity. The present studies investigated changes in carbohydrate metabolism which may regulate energy supply for contractile activity. Rats suspended for seven days and controls were used to determine: serum insulin, response to glucose loading, muscle sensitivity to insulin, and muscle glycogen at rest and following contractile activity. Serum insulin was comparable in control and H/H rats. Elevated plasma glucose and a greater hyperglycemia in response to oral glucose suggested loss of insulin sensitivity. This was confirmed by perfusion studies of hindlimb muscle glucose uptake. While atrophied muscles from H/H rats exhibited increased glycogen concentrations, glycogen was depleted to a greater extent during moderate intensity stimulation. These results suggest alterations in carbohydrate metabolism with whole body suspension. Author

A86-30432*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OXYGEN CONSUMPTION DURING COLD EXPOSURE AT 2.1 G IN RATS ADAPTED TO HYPERGRAVIC FIELDS
J. HOROWITZ, S. PATTERSON, and C. MONSON (NASA, Ames Research Center, Moffett Field, CA; California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-141, S-142. refs
(Contract NSG-2234)

The thermoregulation ability of rats exposed to various gravitational fields is examined. Male Sprague-Dawley rats were exposed to 22 C and 1 G, and 9 C and 2.1 G in experiment one, 1 G, 2.4 G, 5.8 G and 22 + or - 1.5 C in experiment two, and 1 G, 19-22 C, and 5 C in experiment three. It is observed that the core temperature in the control rats was 36.8 + or 0.4 C at 22C and 30.8 + or - 0.6 C at 9 C, and oxygen consumption dropped from 37 + or - 0.3 C core temperature at 22 C, 36.4 + or - 0.3 C at 9 C, 0.4 oxygen consumption was 8.18 + or - 0.9 ml/min at 22 C, and 14.2 + or - 0.4 ml/min at 9 C. The data from experiment two reveal that tail temperature in the control rats peaked at 2.4 G and at 5.8 G for the acclimated rats, and in experiment three a greater decrease in core temperature is detected in the 2.1-G rats. It is noted that prior acclimation to 2.1 G enhances the thermoregulation ability when exposed to the cold. I.F.

A86-30433*# California Univ., Davis.
CHANGES IN FUNCTIONAL METABOLISM IN THE RAT CENTRAL NERVOUS SYSTEM FOLLOWING SPACEFLIGHT
D. M. MURAKAMI, J. D. MILLER, and C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-143, S-144. refs
(Contract NAG2-349; NAS2-10536)

The neuronal metabolism and soma size of neurons within the paraventricular nucleus (PVN) and the supraoptic nucleus of rats are analyzed. Five male Sprague-Dawley rats were flown on Spacelab 3 for 7 days under a 12:12 light/dark cycle and unlimited food and water, and a control group was kept on the ground under similar conditions. The preparation of the hypothalamus of the rats for microscopic examination using thionin or the cytochrome oxidase (CYOX) technique is described. CYOX activity and soma size within the PVN are evaluated. The effects of water drinking pattern and space flight on CYOX activity and soma size are investigated. The data reveal that the flight rats with normal drinking patterns display a decrease in neuronal metabolism within the vasopressin-containing neurons of the hypothalamus and this metabolic change may reflect fluid shifts caused by microgravity. I.F.

A86-30435*# Millsaps Coll., Jackson, Miss.
MORPHOLOGICAL EVIDENCE OF MECHANORECEPTIVE GRAVITY PERCEPTION IN A WATER FLEA - DAPHNIA MAGNA
D. G. MEYERS (Millsaps College, Jackson, MS) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-149, S-150. refs
(Contract NAGW-70; NAGW-643)

Hair-like structures or setae located in the basal membrane of the swimming antennae of the water flea, D. magna, were observed by scanning electron microscopy and compared to mechanoreceptors in the Higher Order Crustacea. Similarities in anatomy, size, attachment, number, length, and orientation support the hypothesis that the setae are rheoceptive mechanoreceptors which mediate gravity perception through deflection by water currents during the sink phase of hop-and-sink swimming behavior. Author

A86-30436*# Eastern Virginia Medical School, Norfolk.
EFFECTS OF CLINOSTAT ROTATION ON AURELIA STATOLITH SYNTHESIS
D. SPANGENBERG, S. DAVIS, and H. ROSS-CLUNIS, III (Eastern Virginia Medical School, Norfolk) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-151, S-152. refs
(Contract NAG2-343)

Aurelia ephyrae develop eight graviceptors (rhopalia) during their metamorphosis from polyps, which are used for positional orientation with respect to gravity. In three experiments for each speed of 1/15, 1/8, 1/4, 1/2, 1, and 24 rpm, groups of six polyps were rotated in the horizontal or vertical plane (control) using clinostats. Other controls were kept stationary in the two planes. Ten ephyrae from each group were collected after 5-6 days at 27 C in iodine and the number of statoliths per rhopalium were counted. Statistical analyses of statolith numbers revealed that horizontal clinostat rotation at 1/4 and 1/2 rpm caused the formation of significantly fewer statoliths per rhopalium than were found in controls. The finding that these slow rates of rotation reduces statolith numbers suggests that the developing ephyrae were disoriented with respect to gravity at these speeds, causing fewer statocytes to differentiate or to mineralize. Author

A86-30437#
PROTEIN CONCENTRATION ELEVATIONS IN LUNGS OF MICE FOLLOWING SUDDEN, TRANSIENT CEPHALAD (+GZ) ACCELERATION
C. J. GUTIERREZ, D. J. CRITTENDEN, J. S. LYTLE, D. R. DUKESHERER, and C. DELMORAL (Central Florida, University, Orlando) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-153, S-154. refs

In order to examine effects of headward acceleration (+Gz) on pulmonary vasculature, mice were subjected to +Gz for 1.8 sec aboard a solid fuel rocket. Protein in bronchoalveolar lavage was measured for evidence of altered microvasculature. Experimental mice were launched and recovered from a parachute descent. Sham control mice were placed in the rocket but not launched. Protein content in control mice (N = 8) was 1.53 + or - 8 (SD) mg/gm wet lung tissue and in experimental mice (n = 11) was elevated to 13.09 + or - 8.31 (SD) mg/gm wet lung (p less than .001). Lung wet weight/body weight ratios were not changed. Sudden transient imposition of +6.22 Gz at liftoff may have induced hypervolemia of basilar microvessels subsequent to increased hydrostatic pressure. Possible stretching of endothelial

junctions may have permitted a small amount of fluid and protein transudation. Fluid may have entered bronchiolar airways subsequently gravitating toward alveoli. Lavage protein may have been recovered from alveolar and bronchiolar regions. Author

A86-30438*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TRANSIENT DEHYDRATION OF LUNGS IN TAIL-SUSPENDED RATS
A. R. HARGENS, J. STESKAL, and E. R. MOREY-HOLTON (NASA, Ames Research Center, Moffett Field, CA; California, University; USVA, Medical Center, San Diego) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-155, S-156. NASA-USVA-supported research. refs

The fluid balance in the lungs of rats exposed to head-down tilt is examined. Six Munich-Wister rats were suspended for 7 days and 10 Sprague-Dawley rats for 14 days using the technique of Morey (1979). The water contents of the lungs of the suspended and a control group are calculated and compared. The data reveal that the two-days suspended rats had dehydrated lungs; however, the lungs of the 14-day suspended and control group rats were similar. It is noted that the dehydration in the 2-day suspended rats is caused by general dehydration not the head-tilt position. I.F.

A86-30439*# California Univ., Davis.
INFLUENCE OF EXPOSURE TO A PROLONGED HYPERDYNAMIC FIELD ON BODY TEMPERATURE IN THE SQUIRREL MONKEY
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-157, S-158. refs
(Contract NAG2-349; NAS2-10536)

The effect of gravitational loading on the regulation of body temperature is examined. Five adult male squirrel monkeys were exposed to a 2-G environment twice for 48 hours, once beginning in the middle of their light cycle and the second time in the middle of their dark cycle. It is observed that a reduction in body temperature occurs during the light cycle phase and at night there is an insignificant change in body temperature. The rhythmic characteristics of the light and dark cycles are analyzed. The data reveal that the body temperature in animals at 2 G is influenced more during the active phase of the animals 24-hour cycle. I.F.

A86-30440*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHANGES IN MUSCLE PROTEIN COMPOSITION INDUCED BY DISUSE ATROPHY - ANALYSIS BY TWO-DIMENSIONAL ELECTROPHORESIS
S. ELLIS (NASA, Ames Research Center, Moffett Field, CA), C. S. GIOMETTI (Argonne National Laboratory, IL), and D. A. RILEY (Wisconsin, Medical College, Milwaukee) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-159, S-160. refs

Using 320 g rats, a two-dimensional electrophoretic analysis of muscle proteins in the soleus and EDL muscles from hindlimbs maintained load-free for 10 days is performed. Statistical analysis of the two-dimensional patterns of control and suspended groups reveals more protein alteration in the soleus muscle, with 25 protein differences, than the EDL muscle, with 9 protein differences, as a result of atrophy. Most of the soleus differences reside in minor components. It is suggested that the EDL may also show alteration in its two-dimensional protein map, even though no significant atrophy occurred in muscle wet weight. It is cautioned that strict interpretation of data must take into account possible endocrine perturbations. R.R.

A86-30441*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
CONSIDERATIONS IN THE DESIGN OF LIFE SCIENCES RESEARCH FACILITIES FOR THE SPACE STATION
M. HEINRICH and C. E. RUDIGER (Lockheed Missiles and Space Co., Inc., Bioastronautics Div., Sunnyvale, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-161, S-162.
(Contract NAS5-20400)

The facilities required for life science research on a permanent Space Station are examined. Specifications important to the designing of facilities and planning of activities on the Space Shuttle are: (1) the species to be tested, (2) the number and procedure for testing, (3) the number of specimens at each sampling time, (4) the analyses required, (5) the methods of preserving samples, instruments, and supplies, and (6) the amount of crew time required. Experiments which are relevant to understanding the effects of microgravity on living systems are to be performed on the Space Station. The design and instruments of a Space Station laboratory and specimen centrifuge are described. I.F.

A86-30442#
HYPOKINEZIA AND SPACE FLIGHT REFLECTED ON RATS STOMACH
P. GROZA, I. LAZAR, E. DRAGOMIRESCU, S. IONESCU, V. ZAMFIR (Academia de Stiinte Medicale, Institutul de Fiziologie Normala si Patologica, Bucharest, Rumania) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-163, S-164. refs

The effects of 5 days of space flight and 7 days of hypokenezia (HK) on the gastric acid secretion, blood pH level, and lactic dehydrogenase (LDH) izoenzymes of the gastric mucosa in nonpregnant, pregnant, and adrenalectomized rats are investigated. It is observed that there is a decrease in glicoprotein content and an increase in the LDH izoenzymes for all the rats after HK. The data reveal that despite the increase in gastric acid output (GAO) due to pregnancy the GAO and blood pH level decrease after HK; however, the GAO in nonpregnant rats is increased. The removal of the adrenal glands after HK does not affect GAO. I.F.

A86-30443#
VIVARIA REQUIREMENTS FOR ANIMAL LIFE CYCLE STUDIES ON SPACE STATION
R. C. MAINS (Mains Asscciates, Berkeley, CA) and J. R. ALBERTS (Star Enterprises, Bloomington, IN) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-165, S-166.

The application of animal vivaria to life cycle research is discussed. The requirements for the reproduction/growth, maintenance, and measurement of amphibians and rodents in space are described. The development of systems capable of reproduction and growth, and life support of animals is examined. I.F.

A86-30444*# Phytoresource Research, Inc., College Station, Tex.
TISSUE CULTURE APPARATUS FOR FLIGHT EXPERIMENTATION
H. W. SCHELD, J. W. MAGNUSON (PhytoResource Research, Inc., College Station, TX), and A. D. KRIKORIAN (New York, State University, Stony Brook) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-167, S-168.
(Contract NAS9-17292; NAS9-17291)

The development of an apparatus for in-flight treatment of cells, tissues, or small organisms for microscopic and chemical analyses is discussed. The hardware for the apparatus is to have: (1) automated functions, (2) the capability to interface with ground-based facilities, (3) independently controlled chambers, (4) variable chamber configurations and volumes, and (4) the capabilities for processing the materials. The components of the equipment used on Skylab 3 for the study of animal cells are described. The design of an apparatus which incorporates all the required capabilities is proposed. I.F.

A86-30447#
REDUCTION OF CIRCADIAN DISRUPTION FOLLOWING SURGERY BY INGESTION OF CAFFEINE IN THE LABORATORY RAT
L. A. FARR, C. CAMPBELL-GROSSMAN, S. L. LANGENBERG-PANZER, J. M. MACK, M. J. PETERSEN (Nebraska, University, Medical Center, Omaha) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-173, S-174. refs
(Contract PHS-R01-NU-001098-01)

The purpose of this study was to test the effects of caffeine ingestion, prior to surgery, on disruption of circadian rhythms following surgery. The study measured 20 male Sprague-Dawley rats' temperature and locomotor activity by short range, radio/telemetry and infrared-monitoring. Eight rats were subjected to surgical laparotomy using general anesthesia and then monitored until their activity had returned to presurgical levels. Two groups of six rats each, received either caffeine in distilled water or distilled water, orally for five days. On day six, animals were subjected to surgical laparotomy and data were recorded as before. Temperature cycles shifted during treatment only with caffeine. Both groups shifted their activity peaks during treatment. Shifts were more pronounced with caffeine. Following surgery, unmanipulated rats shifted their temperature peaks to inappropriate times of day. Animals which received water showed less disruption, while caffeine rats were not shifted following surgery. Activity results were similar. It is concluded that caffeine provides a cue to circadian timing which reduces disruption following surgery. Author

A86-30449*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE STATION LIFE SCIENCE RESEARCH FACILITY - THE VIVARIUM/LABORATORY
J. D. HILCHEY (NASA, Marshall Space Flight Center, Huntsville, AL) and R. D. ARNO (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-177, S-178.

Research opportunities possible with the Space Station are discussed. The objective of the research program will be study gravity relationships for animal and plant species. The equipment necessary for space experiments including vivarium facilities are described. The cost of the development of research facilities such as the vivarium/laboratory and a bioresearch centrifuge is examined. I.F.

A86-30451*# California Univ., Davis.
LIFE SCIENCE RESEARCH ON THE SPACE STATION
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-181, S-182. refs
(Contract NAG2-349)

The requirements for studying the mechanisms of response and adaptation to the microgravity environment are examined. The necessary facilities, equipments, and technologies for the use of animals in space research are discussed. The application of a centrifuge to the analysis of the effects of microgravity on physiological adaptation is described. I.F.

A86-30452*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
MORPHOLOGY OF HUMAN EMBRYONIC KIDNEY CELLS IN CULTURE AFTER SPACE FLIGHT
P. TODD, M. E. KUNZE, K. WILLIAMS, D. R. MORRISON, M. L. LEWIS, and G. H. BARLOW (NASA Johnson Space Center, Houston, TX; Bioprocessing and Pharmaceutical Research Center, Philadelphia; Pennsylvania State University, University Park, PA; Michael Reese Research Foundation, Chicago, IL) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-183, S-184.

The ability of human embyronic kidney cells to differentiate into small epithelioid, large epithelioid, domed, and fenestrated morphological cell types following space flight is examined. Kidney cells exposed to 1 day at 1 g, then 1 day in orbit, and a 12 minute passage through the electrophoretic separator are compared with control cultures. The data reveal that 70 percent of small epithelioid, 16 percent of large epithelioid, 9 percent of dome-forming, and 5 percent of fenestrated cells formed in the space exposed cells; the distributions correlate well with control data. The formation of domed cells from cells cultured from low electrophoretic mobility fractions and small epithelioid cells from high mobility fractions is unaffected by space flight conditions. It is concluded that storage under microgravity conditions does not influence the morphological differentiation of human embryonic kidney cells in low-passage culture. I.F.

A86-30454*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
RAT MAINTENANCE IN THE RESEARCH ANIMAL HOLDING FACILITY DURING THE FLIGHT OF SPACE LAB 3
T. FAST, R. GRINDELAND, L. KRAFT, M. RUDER, M. VASQUES (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-187, S-188.

To test the husbandry capabilities of the Research Animal Holding Facility (RAHF) during space flight, 24 male rats were flown on Spacelab 3 for 7 days. Twelve large rats (400 g, LF), 5 of which had telemetry devices implanted (IF), and 12 small rats (200 g, SF) were housed in the RAHF. Examination 3 hr after landing (R + 3) revealed the rats to be free of injury, well nourished, and stained with urine. At R + 10 the rats were lethargic and atonic with hyperemia of the extremities and well groomed except for a middorsal area stained with urine and food. Both LF and SF rats showed weight gains comparable to their IG controls; IF rats grew less than controls. Food and water consumption were similar for flight and control groups. Plasma concentrations of total protein, sodium, albumin and creatinine did not differ between flight and control groups. LF and SF rats had elevated plasma glucose, and SF rats had increased blood urea nitrogen, potassium and glutamic pyruvic transaminase. These observations indicate that rats maintained in the RAHF were healthy, well nourished and experienced minimal stress; physiological changes in the rats can thus be attributed to the effects of space flight Author

A86-30455*# Purdue Univ., Indianapolis, Ind.
ELECTRON MICROPROBE ANALYSES OF CA, S, MG AND P DISTRIBUTION IN INCISORS OF SPACELAB-3 RATS
G. D. ROSENBERG (Purdue University, Indianapolis, IN) and D. J. SIMMONS (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-189, S-190.
(Contract NASA ORDER-A-21997-C)

The distribution of Ca, S, Mg and P was mapped within the incisors of Spacelab-3 rats using an electron microprobe. The data indicate that Flight rats maintained in orbit for 7 days have significantly higher Ca/Mg ratios in dentin due to both higher Ca and lower Mg content than in dentin of ground-based Controls. There is no statistical difference in distribution of either P or S within Fligth animals and Controls, but there is clear indication that, for P at least, the reason is the greater variability of the Control data. These results are consistent with those obtained on a previous NASA/COSMOS flight of 18.5 days duration, although they are not pronounced. The results further suggest that continuously growing rat incisors provide useful records of the effects of weightlessness on Ca metabolism. Author

A86-30456*# Arizona Univ., Tucson.
RESPONSES OF AMINO ACIDS IN HINDLIMB MUSCLES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
M. E. TISCHLER, E. J. HENRIKSEN, S. JACOB, and P. H. COOK (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-191, S-192. refs
(Contract NAGW-227)

Amino acids were assayed in muscles from rats exposed to 7 days of hypogravity and 12 h of gravity (F) or 6 days of suspension with (R) or without (H) 12 h of loading. In these groups, lower aspartate was common only to the soleus (SOL) relative to control muscles, the smallest difference being in group R. This difference in aspartate for F and H, but not for R, correlated with lower malate suggesting diminution of citric acid cycle intermediates. The R SOL value was increased over the H SOL. Therefore desite 12 h of loading, the F SOL was more comparable to the H SOL. The role of stress in preventing recovery of the F SOL was apparent from the ratios of glutamine/glutamate. Synthesis of glutamine is enhanced by glucocorticoids and is reflected by an increased ratio. In 5 of the 6 F muscles studied, this ratio was greater than in controls. In contrast, the ratio in all R muscles was similar to controls and showed recovery from the values in H muscles. Hence the post-flight treatment of F rats may have produced additional stress. Despite this stress, in some respects the SOL responses to hypogravity were similar to its responses to unloding by suspension. Author

A86-30457*# Arizona Univ., Tucson.
MUSCLE PROTEIN AND GLYCOGEN RESPONSES TO RECOVERY FROM HYPOGRAVITY AND UNLOADING BY TAIL-CAST SUSPENSION
E. J. HENRIKSEN, M. E. TISCHLER, S. JACOB, and P. H. COOK (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-193, S-194. Previously announced in STAR as N85-35591. refs
(Contract NAGW-227)

Previous studies in this laboratory using the tail-bast hindlimb suspension model have shown that there are specific changes in protein and carbohydrate metabolism in the soleus muscle due to unloading. For example, 6 days of unloading caused a 27 percent decrease in mass and a 60 percent increse in glycogen content in the soleus muscle, while the extensor digitorum longus muscle was unaffected. Also, fresh tissue tyrosine and its in vitro release from the muscle are increased in the unloaded soleus, indicating that this condition causes a more negative protein balance. With these results in mind, studies to investigate the effect of hypogravity on protein and carbohydrate metabolism in a number of rat hindlimb muscles were carried out. G.L.C.

A86-30458*# Tennessee Univ., Knoxville.
HEMATOLOGIC PARAMETERS OF ASTRORATS FLOWN ON SL-3
R. D. LANGE, R. B. ANDREWS, L. A. GIBSON, P. WRIGHT, C. D. R. DUNN (Tennessee, University, Knoxville) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-195, S-196. NASA-supported research. refs

Hematologic studies were performed on a group of large and small rats which were sacrificed after flying in life sciences shuttle engineering flight SL-3. The results are presented on flight (F) and control (C) 200 gm rats. The small flight animals demonstrated a significant increase in hematocrits, red blood cell counts, hemoglobins and peripheral blood percentages of neutrophils as well as a decrease in percentage of lymphocytes. Erythropoietin (Ep) determinations were similar for the two groups as were the bone marrow an spleen differential counts. In vitro cultures for erythroid colonies of bone marrow showed that in response to different doses of Ep, in all cases where differnces were statistically significant, the F rats had increased colony counts. The changes in red cell parameters could be caused by a decrease in plasma volume. However, no isotopic studies were possible on this flight and this lack points up the need for such studies to determine the red cell mass and plasma volume. Author

A86-30459*# Pennsylvania State Univ., University Park.
MICROGRAVITY ASSOCIATED CHANGES IN PITUITARY GROWTH HORMONE (GH) CELLS PREPARED FROM RATS FLOWN ON SPACE LAB 3
W. C. HYMER, M. FARRINGTON, C. HAYES (Pennsylvania State University, University Park), R. GRINDELAND, T. FAST (NASA, Ames Research Center, Moffett Field, CA) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-197, S-198. refs
(Contract NASA ORDER A-21991-C)

The effect of microgravity on the release of pituitary growth hormone (GH) in rats is studied. The pituitary glands from six adult rats exposed to microgravity are analyzed for in vitro and in vivo changes in pituitary growth hormone cells. The GH cell functions in the somatotrophs of flight rats are compared to a control group. The two assay procedures employed in the experiment are described. It is observed that intracellular levels of GH are two to three times greater in the flight rats than in the control group; however, the amount of GH released from the somatotrophs is 1.11 + or - 0.4 micrograms for the flight rats and 1.85 + or - 1.3 micrograms for the control rats. I.F.

A86-30460*# California Univ., Davis.
HOMEOSTASIS AND BIOLOGICAL RHYTHMS IN THE RAT DURING SPACEFLIGHT
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-199, S-200. refs
(Contract NAG2-349; NAS2-10536)

The effects of microgravity on the physiological regulation of homeostatic systems is studied. The temperature and heart rate of rats exposed to seven days of microgravity and a 12:12 light/dark cycle are analyzed. A 24-hour nocturnal rhythmicity is observed in the control and in-flight heart rates and body temperatures. The preflight daytime body temperature was calculated as 37.2 + or - 0.03 C and in-flight as 37.4 + or 0.04 C; nighttime body temperature preflight daytime was determined as 38.0 + or - 0.02 C, and in-flight as 37.8 + or 0.06 C. The 24-hour mean heart rate was

depressed from 412 + or - 3.3 bpm preflight to 373 + or - 2.4 bpm in-flight; this change is noted in both dark and light conditions. It is detected that microgravity alters the steady state regulation of heart rate and body temperature. I.F.

A86-30461*# California Univ., Davis.
EARLY ADAPTATION TO ALTERED GRAVITATIONAL ENVIRONMENTS IN THE SQUIRREL MONKEY
C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-201, S-202.
(Contract NAG2-349; NAS2-10536)

The feeding behavior of two squirrel monkeys flown in Spacelab 3 is compared to that of six monkeys exposed to 1.5 G through centrifugation. The monkeys in the centrifugation study were housed unrestrained in cages, maintained at 25 C + or - 1 C, exposed to a 12:12 light/dark cycle, and had unrestrained access to food and water. The Spacelab monkeys were maintained at 26 C, exposed to a 12:12 light/dark cycle and had unlimited food and water. It is observed that the centrifuge rats displayed a change in feeding behavior for 4 days prior to resuming a normal pattern; one Spacelab monkey exhibited a 6 day depression before recover to control levels, and the feeding pattern of the second monkey was not influenced by the environment. It is noted that the effect of an altered dynamic environment is variable on the feeding behavior of individual monkeys. I.F.

A86-30462*# California Univ., Davis.
EFFECTS OF WEIGHTLESSNESS ON NEUROTRANSMITTER RECEPTORS IN SELECTED BRAIN AREAS
J. D. MILLER, D. M. MURAKAMI (California, University, Davis), B. A. MCMILLEN, M. M. MCCONNAUGHEY, H. L. WILLIAMS (East Carolina University, Greenville, NC) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-203, S-204. refs
(Contract NAS2-10536)

The central nervous system receptor dynamics of rats exposed to 7 days of microgravity are studied. The receptor affinity and receptor number at the hippocampus, lateral frontal cortex, prefrontal cortex, corpus striatum, cerebellum and pons-medulla, and the Na(+)/K(+)ATPase activity are examined. The data reveal that there is no significant change in the receptor affinity and receptor number for the lateral frontal cortex, prefrontal cortex, cerebellum and pons-medulla; however, there is an increase from 81 + or - 11 to 120 + or 5 fmole/mg protein in the receptor number for hippocampal binding, and a decrease in receptor number for the striatum from 172 + or - 14 to 143 + or - 10 fmoles/mg protein. A 9 percent decrease in Mg-dependent Na(+)/K(+)ATPase activity is observed. It is detected that the terminal mechanism may be affected by exposure to microgravity. I.F.

A86-30463*# California Univ., Davis.
THE EFFECT OF A HYPERDYNAMIC ENVIRONMENT ON THE DEVELOPMENT OF THE RAT RETINA
D. M. MURAKAMI and C. A. FULLER (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-205, S-206. refs
(Contract NAG2-349; NAS2-10536)

The effects of a 2 G field on the retinal development of the layers in the rat and central visual system nuclei are investigated. The thickness of the retinal layers, ganglion cells, and brains of male and female Wistar rats suspended from an 18 foot diameter centrifuge creating a 2 G field are evaluated and compared with a control group. A decrease in the thickness of the outer nuclear layer (ONL) of 37.1 percent, of 58.5 percent in the inner nuclear layer (INL), and of 28.8 percent in the inner plexiform layer (IPL), and a reduction in body weight are observed in the 2-G rats. The data reveal that the ganglion cells and visual system nuclei activity correspond well with the control data; however, the medial terminal nucleus (MTN) activity is inhibited in the 2-G rats. It is concluded that the differences in ONL and IPL are attributed to body weight reduction, but the INL and MTN are affected by the 2-G conditions. I.F.

A86-30464*# Medical Coll. of Wisconsin, Milwaukee.
MORPHOLOGICAL AND BIOCHEMICAL CHANGES IN SOLEUS AND EXTENSOR DIGITORUM LONGUS MUSCLES OF RATS ORBITED IN SPACELAB 3
D. A. RILEY, T. SLOCUM, J. L. W. BAIN, F. R. SEDLAK (Wisconsin, Medical College, Milwaukee), S. ELIS, and T. SATYANARAYANA (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-207, S-208. refs
(Contract NAS2-11305; NCC2-266; NASA ORDER A-21992-C)

Muscle atrophy in rats exposed to hypogravity for seven days aboard Spacelab 3 is examined. Hindlimb muscles were harvested 12-16 days postflight, and prepared for enzyme studies and electron microscopy. Simple cell shrinkage was found, with a mean fiber area decrease of 35.8 percent for soleus and 24.9 percent for extensor digitorum longus (EDL) flight muscle fibers, as compared with control muscle fibers. EDL and soleus muscles showed increases in alkaline myofibrillar ATPase, alpha glycerophosphate dehydrogenase, and glycogen, and a decrease in NADH dehydrogenase staining. The 26 percent increase in calcium activated protease suggests that the focal degradation of myofibrils is the key process of myofibril breakdown. The presence in the flight soleus muscles of one percent necrotic fibers is unexplained. The observed shift towards histochemical fast-muscle type properties is consistent with previous findings. R.R.

A86-30465*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MICROGRAVITY CHANGES IN HEART STRUCTURE AND CYCLIC-AMP METABOLISM
D. E. PHILPOTT, A. FINE, K. KATO, R. EGNOR, L. CHENG (NASA, Ames Research Center, Moffett Field, CA; USVA, Medical Center, New York, NY; NIH, National Institute of Dental Research, Bethesda, MD) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-209, S-210.

The effects of microgravity on cardiac ultrastructure and cyclic AMP metabolism in tissues of rats flown on Spacelab 3 are reported. Light and electron microscope studies of cell structure, measurements of low and high Km phosphodiesterase activity, cyclic AMP-dependent protein kinase activity, and regulatory subunit compartmentation show significant deviations in flight animals when compared to ground controls. The results indicate that some changes have occurred in cellular responses associated with catecholamine receptor interactions and intracellular signal processing. C.D.

A86-30466*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REDUCTION OF THE SPERMATOGONIAL POPULATION IN RAT TESTES FLOWN ON SPACE LAB-3
D. E. PHILPOTT, J. STEVENSON, R. CORBETT (NASA, Ames Research Center, Moffett Field, CA), W. SAPP, C. WILLIAMS (Tuskegee Institute, AL) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-211, S-212. refs

Quantization of the testicular spermatogonial population reduction in six rats is performed 12 hours after their return from seven days aboard Space Lab-3. The observed 7.1 percent organ weight loss, and 7.5 percent stage six spermatogonial cell population reduction in comparison with control rats correlate very

well. Accurate dosimetry was not conducted on board, but radiation can not be considered the primary cause of the observed change. The decrease in protein kinase in the heart of these rats indicates that stress from adapting to weightlessness, the final jet flight, or other sources, is an important factor. R.R.

A86-30467*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF FLIGHT IN MISSION SL-3 ON INTERFERON-GAMMA PRODUCTION BY RATS
C. L. GOULD, J. A. WILLIAMS, A. D. MANDEL, and G. SONNENFELD (NASA, Ames Research Center, Moffett Field, CA; Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-213, S-214. refs
(Contract NCC2-213)

Rats flown in Space Shuttle mission SL-3 were sacrificed after flight and spleens were removed. Cultures of spleen cells were challenged with the mitogen concanavalin-A to attempt to induce interferon-gamma. Most control, ground-based rats had spleen cells that produced moderate titers of interferon-gamma. Spleen cells from flown rats did not produce interferon-gamma in most cases, and one flown rat produced minimally detectable amounts of interferon. These data suggest that interferon-gamma production was inhibited in rats flown in mission SL-3 immediately upon return to earth. Author

A86-30468#
BIOCHEMICAL AND MORPHOLOGICAL EVALUATION OF THE EFFECTS OF SPACE FLIGHT ON RAT SALIVARY GLANDS
M. I. MEDNIEKS and A. R. HAND (NIH, National Institute of Dental Research, Bethesda, MD) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-215, S-216. refs

Salivary gland tissues from rats from the Spacelab 3 flight were used for both cellular and molecular level analyses in conjunction with electron microscopic evaluation of tissue ultrastructure. Intracellular processes appear to be modified in salivary gland cells one day after space flight. Changes in cA-PK holoenzyme association and subcellular subunit distribution suggest alterations in reactions which are mediated via cyclic AMP. These observations are consistent with the reported decrease in circulating catecholamines during simulated weightlessness. Since no dramatic pathological changes were observed in the salivary glands, the effects may well be within the homeostatic or adaptational range of the animals. C.D.

A86-30469#
MICROPROBE ANALYSIS OF EPIPHYSEAL PLATES FROM SPACELAB 3 RATS
J. DUKE, L. JANER, M. CAMPBELL, and J. MORROW (Texas, University, Houston) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-217, S-218. refs

Ultrastructural studies of growth plates from Cosmos 1129 rats showed delayed production and mineralization of matrix vesicles. To determine if differences in differentiation could be detected in seven days, proximal tibial growth plates were obtained from rats flown aboard Spacelab 3, and prepared by a freeze-substitution method for microanalysis. Concentration of elements was measured in the matrix of longitudinal septa of the growth plate in the resting, proliferative, hypertrophic, and calcifying zones. In control plates, all four zones had high levels of Na, and in unmineralized regions, low levels of Mg, P and Ca. K and S levels were high in the resting zone, and increased from the proliferative to the calcifying zones. The level of P rose in the mineralized regions and Ca/P ratios ranged from 1.0 to 1.6. Flight animals had low Na and K values, although Mg values seemed unaffected. S values were much less than controls, and Ca was less in unmineralized regions, with Ca/P ratios similar to controls. These data indicate that even a short space flight can alter bone mineralization. Author

A86-30470*# Michigan Univ., Ann Arbor.
OTOCONIAL MORPHOLOGY IN SPACE-FLOWN RATS
M. D. ROSS, K. DONOVAN, and O. CHEE (Michigan, University, Ann Arbor) (International Union of Physiolcgical Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-219, S-220. refs
(Contract NAS2-10535)

The inner ear maculas of rats exposed to space flight for seven days were studied, and the findings are discussed. It is concluded that exposure to weightlessness for short periods of time has no morphologically detectable degenerative effect on the macular receptors. The results suggest, however, that slight increases in otoconial mass may have occurred in flight animals compared to ground-based controls. C.D.

A86-30471*# Louisville Univ., Ky.
EFFECT OF SEVEN DAYS OF SPACEFLIGHT ON HINDLIMB MUSCLE PROTEIN, RNA AND DNA IN ADULT RATS
J. M. STEFFEN and X. J. MUSACCHIA (Louisville, University, KY) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-221, S-222. NASA-supported research. refs

Effects of seven days of spaceflight on skeletal muscle (soleus, gastrocnemius, EDL) content of protein, RNA and DNA were determined in adult rats. Whereas total protein contents were reduced in parallel with muscle weights, myofibrillar protein appeared to be more affected. There were no significant changes in absolute DNA contents, but a significant (P less than 0.05) increase in DNA concentration (microgram/milligram) in soleus muscles from flight rats. Absolute RNA contents were significantly (P less than 0.025) decreased in the soleus and gastrocnemius muscles of flight rats, with RNA concentrations reduced 15-30 percent. These results agree with previous ground-based observations on the suspended rat with unloaded hindlimbs and support continued use of this model. Author

A86-30472#
1,25-DIHYDROXYVITAMIN D3 RECEPTORS IN SPACE-FLOWN VS. GROUNDED CONTROL RAT KIDNEYS
D. J. MANGELSDORF, S. L. MARION, J. W. PIKE, and M. R. HAUSSLER (Arizona, University, Tucson) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-223, S-224. refs
(Contract NIH-AM-15781-14)

The effects of microgravity on the ability of 1,25-Dihydroxyvitamin D3 receptors to retain calcium in kidneys is examined. Kidney samples from five space-flown and five ground control rats were studied. The analysis of the 1,25(OH)2D3 receptors using DEAE-filter binding assay is described. The quantity of receptors and binding dissociation constant are derived from the saturation curve of specific hormone-receptors binding by employing the Scatchard transformation. The data reveal that for the ground control rats the receptor number is 27.9 + or - 0.80 fmol/mg protein and the binding dissociation constant is 0.60 + or - 0.27 nM; for the space-flown rats the receptor number is 27.6 + or 10.1 fmol/mg protein and the constant is 0.27 + or - 0.08 nM. No significant difference is observed between the ground control and space-flown kidney 1,25(OH)2D3 receptors. I.F.

A86-30473*# Columbia Univ., New York.
MORPHOLOGIC AND HISTOCHEMICAL STUDIES OF BONE CELLS FROM SL-3 RATS
S. B. DOTY (Columbia University, New York) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-225, S-226. refs
(Contract NCC2-325)

Previous studies of rat bone following space flight indicate a significant reduction in new bone formation as a result of hypogravity. In the present study of animals from SL-3 flight, the cellular activity of the bone forming cells, the osteoblasts, was investigated. Measurements of alkaline and acid phosphatase, Golgi activity, secretory granule size, and lysosomal activity, all indicated very little difference between flight and flight-simulated controls. However, there was a tendency for osteoblasts in compact bone of flight animals to show a smaller cytoplasmic volume compared to non-flight controls. If, as in previous studies, a significant reduction in bone formation occurred, it could be due to a normal level of procollagen degradation within these smaller osteoblasts, resulting in less collagen secretion per cell. Author

A86-30474*# California Univ., San Francisco.
OSTEOCALCIN AS AN INDICATOR OF BONE METABOLISM DURING SPACEFLIGHT
P. E. PATTERSON-BUCKENDAHL, C. E. CANN (California, University, San Francisco), R. E. GRINDELAND, S. B. ARNAUD (NASA, Ames Research Center, CA), and R. B. MARTIN (California, University, Davis) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-227, S-228. refs

The effect of microgravity on osteocalcin (OC) is investigated in rats flown on Spacelab 3. Serum, Ca, Pi, total protein, alkaline phosphatase, and OC contents, and the breaking strength of the humerus of control and Spacelab rats are calculated; the procedures utilized for these analyses are described. It is detected that the OC is reduced, and the serum and alkaline phosphatase are unaffected by microgravity. I.F.

A86-30475#
HEPATIC ENZYMES OF SPHINGOLIPID AND GLYCEROLIPID BIOSYNTHESIS IN RATS FROM SPACELAB 3
A. H. MERRILL, JR., E. WANG, and J. L. HARGROVE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-229.

A86-30476#
HEPATIC ENZYME ADAPTATION IN RATS AFTER SPACE FLIGHT
J. L. HARGROVE and D. P. JONES (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-230.

A86-30477#
ATRIOPEPTIN (AP-3) IN ATRIA AND PLASMA OF RATS ORBITED ABOARD NASA SPACELAB (SL3) FOR SEVEN DAYS
W. H. INGE and D. K. HARTLE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-231, S-232. refs

Six male rats were orbited aboard Spacelab 3 for 7 days, landed in CA and flown to FL where they were anesthetized (halothane), decapitated, blood collected, and plasma separated. Ventricular samples and atria were resected. All samples were frozen at -70 C. Samples from 6 ground control animals were similarly prepared. Atriopeptin immunoreactivity (APir) was determined for plasma and both right and left atria. All plasma levels were an order of magnitude higher than unstressed basal levels, presumably due to anesthesia. Subsequent laboratory studies confirmed that plasma APir is 400 percent higher in rats anesthetized with halothane than in conscious controls. No differences between control and flight rat plasma APir were found. Both right and left atrial APir content in flight rats were slightly elevated over controls but not significantly. It is concluded that an adequate test of the effects of microgravity on AP-3 secretion requires serial inflight plasma sampling in conscious rats to avoid the confounding effects of reentry, postflight delays, and anesthesia. Author

A86-30478#
PLASMA RENIN CONCENTRATION (PRC) OF RATS ORBITED FOR 7 DAYS ABOARD NASA SPACELAB 3
D. K. HARTLE and W. H. INGE (Emory University, Atlanta, GA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-233, S-234. refs

PRC were determined in six rats (F) orbited aboard SL3 for 7-days and in six ground control rats (G). F were flown from CA to Kennedy Space Center (KSC). Both F and G rats were transported similarly from KSC to Kennedy Research Labs, anesthetized with halothane (HAL) and decapitated. Plasma was obtained from trunk blood and frozen at -70 C. PRC were estimated by measuring the conversion of rat renin substrate to angiotensin I (AI) using radioimmunoassay. PRC were also estimated in four groups of rats to assess the influences of HAL or decapitation on renin secretion in the F and G rats. No significant differences were found in PRC between F and G, although the F mean was lower. Neither HAL nor decapitation produced a significant increase in PRC above the levels measured in control conscious rats. Because of the 12-14 hour delay between reentry and sampling, all renin measured was probably secreted in the postflight period. So the PRC of F do not indicate levels during flight, but only the levels obtained by F 12-14 hrs after reentry, and subjected to HAL anesthesia and decapitation. Author

A86-30479#
BONE MATURATION IN RATS FLOWN ON THE SPACELAB-3 MISSION
J. E. RUSSELL and D. J. SIMMONS (Washington University, St. Louis, MO) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-235, S-236. refs

The matrix/mineral maturational patterns in six male Sprague-Dawley rats exposed to 7 days of spaceflight are studied. The metaphyseal and cortical bone samples are separated into 1.3-1.7, 1.8-1.9, 2.0-2.1, and 2.2-2.9 specific gravity fractions. The calcium, inorganic phosphorous (Pi), and collagen hydroxyproline (HO-Pr) contents are calculated. It is detected that in the spaceflight metaphyseal bone there is a shift in the Ca, Pi, and HO-Pr profiles toward higher density fractions and a low Ca/Pi molar ratio; in the spaceflight cortical bone less Ca, Pi, HO-Pr are observed for lower specific gravity fractions and the Ca/Pi molar ratio is unchanged. The data reveal that spaceflight alters the quality of rat femur, and decreases osteoblast function, and bone mass in the axial and appendicular skeleton. I.F.

A86-30480*# Louisville Univ., Ky.
THE USE OF SUSPENSION MODELS AND COMPARISON WITH TRUE WEIGHTLESSNESS
X. J. MUSACCHIA (Louisville, University, KY) and S. ELLIS (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-237 to S-240.

A resume is presented of various papers concerning the effect of weightlessness on particular physiological and biochemical

phenomena in animal model systems. Findings from weightlessness experiments on earth using suspension models are compared with results of experiments in orbit. The biological phenomena considered include muscle atrophy, changes in the endocrine system, reduction in bone formation, and changes in the cardiovascular system. C.D.

A86-30682
CAROTID BODIES ARE REQUIRED FOR VENTILATORY ACCLIMATIZATION TO CHRONIC HYPOXIA
C. A. SMITH, G. E. BISGARD, A. M. NIELSEN, L. DARISTOTLE, N. A. KRESSIN (Wisconsin, University, Madison; Wisconsin, Medical College, Milwaukee) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1003-1010. Research supported by the University of Wisconsin. refs
(Contract NIH-HL-15469; NIH-HL-15473)

The effects of moderate and severe hypoxemia on the ventilatory responses of intact and carotid body-denervated (CBD) goats were investigated. In the intact group, both moderate and severe hypoxemia produced time-dependent decreases in arterial PCO2, which were largely complete by 8 hrs and were maintained throughout the 7 days of hypobaria. In contrast, the same levels of arterial hypoxemia produced no significant changes in arterial PCO2, H(+), or HCO3(-) in the CBD animals. While acute restoration of normoxia in chronically hypoxic intact animals produced time-dependent increases in arterial PCO2 over 2 h, acute restoration of normoxia in the chronically hypoxic CBD goats has caused hyperventilation. The results indicate that carotid bodies are required for any significant hyperventilatory response to hypoxemia, and suggest that brain H(+) does not play a crucial role in this ventilatory response. I.S.

A86-30683
VENTILATORY ACCLIMATIZATION TO HYPOXIA IS NOT DEPENDENT ON CEREBRAL HYPOCAPNIC ALKALOSIS
G. E. BISGARD, M. A. BUSCH, and H. V. FORSTER (Wisconsin, University, Madison; Wisconsin, Medical College, Milwaukee) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1011-1015. refs
(Contract NIH-HL-15473)

A86-30685
ENERGY BALANCE IN EXERCISE-TRAINED RATS ACCLIMATED AT TWO ENVIRONMENTAL TEMPERATURES
D. RICHARD, J. ARNOLD, and J. LEBLANC (Universite Laval, Quebec, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1054-1059. refs

The effect of exercise training (by running on a motor-driven treadmill) on energy balance of rats acclimated at either 24 or 4 C was investigated. Resting and exercise oxygen consumption and the energy contents of diet and feces were measured throughout, and the carcass contents of energy, fat, protein, and carbohydrate, as well as mitochondrial guanosine 5'-diphosphate (GDP)-binding in brown adipose tissue (BAT), were determined after 45 days of training. While cold acclimation led to increased food intake in all rats, its effect on fat gain was seen only in the sedentary group. Cold acclimation has also increased BAT-bound GDP, indicating increased thermogenesis in the BAT, but exercise had no effect on BAT thermogenesis. The energy balance results suggested that energy training in rats does not cause any changes in energy expenditure other than the energy spent on physical activity. I.S.

A86-30892
THERMOENCEPHALOSCOPY [TERMOENTSEFALOSKOPIIA]
I. A. SHEVELEV, E. N. TSYKALOV, K. P. BUDKO, A. M. GORBACH, and G. A. SHARAEV (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 7-15. In Russian. refs

Infrared images of human and animal cerebral cortex were obtained by means of noninvasive thermoscopy, using an AGA-780 thermoscope. The thermal maps, obtained after stimulation by light and sound, electrical skin stimulation, direct electrical irritation of cortex, and motor cortex tests, display the presence of discrete focuses of warming, followed by cooling, in the respective reaction zones of the cerebral cortex. The space-time and amplitude characteristics of the thermograms suggest that changes of local blood flow are among the factors causing the observed thermal changes. The maps display a spatial resolution of 30 microns per element of thermal image, surpassing the resolution ranges provided by the more traditional methods of electroencephalography, radioisotope mapping and blood flow mapping. I.S.

A86-30897
HYPOBIOSIS AND FUNCTIONAL RESISTANCE TO COLD [GIPOBIOZ I FUNKTSIONAL'NAIA KHOLODOVAIA TERMOREZISTENTNOST']
N. N. TIMOFEEV (Institut Farmakologii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 110-124. In Russian. refs

The subcellular biochemical mechanisms responsible for the maintenance of the viability of cells and organisms at prolonged exposures to low temperatures are discussed. It is believed that the primary changes take place at the level of cellular membranes, where the endogenous antioxidants are pumped from most of the membrane circumference to a specific 'locus' in the membrane. The resulting oxidation of arachidonic acid, accompanied by a sharp increase in the saturated fatty acid content in the membrane sections devoid of antioxidants leads to 'gelling' of most of the membrane, except for the antioxidant-rich 'locus', which remains fluid, insuring the membrane's ability to reverse the process. The gelled membrane preserves the membraneous proteins, and thus, the viability of the cell. At near-freezing temperatures the fluid locus can be protected by availability of high concentrations of either endogenous tocopherol (in hibernating animals) or injected antioxidants. I.S.

A86-31224
A BIDOMAIN MODEL FOR THE EXTRACELLULAR POTENTIAL AND MAGNETIC FIELD OF CARDIAC TISSUE
B. J. ROTH and J. P. WIKSWO, JR. (Vanderbilt University, Nashville, TN) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, April 1986, p. 467-469. refs
(Contract N00014-82-K-0107)

A bidomain volume conductor model is developed to represent cardiac muscle strands, enabling the magnetic field and extracellular potential to be calculated from the cardiac transmembrane potential. The model accounts for all action currents, including the interstitial current between the cardiac cells, and thereby allows quantitative interpretation of magnetic measurements of cardiac muscle. Author

A86-31371
PROBLEMS IN MEDICAL BIORHYTHMOLOGY [PROBLEMY MEDITSINSKOI BIORITMOLOGII]
N. R. DERIAPA, M. P. MOSHKIN, and V. S. POSNYI Moscow, Izdatel'stvo Meditsina, April 1985, 208 p. In Russian. refs

The aspects of correlation between internal and external rhythmic processes, the basic correlation principles, and the significance of adaptive biorhythmicity are discussed. Consideration is given to the issues of mental and physical circadian biorhythms and their functional optima, the seasonal rhythms of man's physiological functions, the genetically determined factors in biorhythmicity and in adaptability, and the regional aspects of rhythmicity in physiological processes. Special attention is paid to the aspects of chronopathology: the primary and secondary effects of environmental temporal changes, chronic diseases caused by desynchronization, and the importance of biorhythms in planning pharmacological regimens. I.S.

A86-31375
MECHANISMS OF THE RADIATION PROTECTION EFFECT AND INDICATION OF THE EFFICIENCY OF RADIOPROTECTORS [MEKHANIZMY RADIOZASHCHITNOGO EFFEKTA I INDIKATSIIA EFFEKTIVNOSTI RADIOPROTEKTOROV]
L. M. ROZHDESTVENSKII Moscow, Energoatomizdat, 1985, 128 p. In Russian. refs

Experimental and theoretical research related to the use of radioprotectors in the radiation therapy of malignant growths and in other branches of radiation medicine is reviewed. In particular, attention is given to the estimation of the protective action of radioprotectors, the mechanisms of the oxygen effect and of the radioprotective action, and methods for investigating the possibilities of the indication of the efficiency of radioprotectors. Results of investigations of the indicating possibilities of some pharmacological effects of radioprotectors are presented. V.L.

A86-31650
ECTO-PROTEIN KINASE ACTIVITY ON THE EXTERNAL SURFACE OF NEURAL CELLS
Y. H. EHRLICH, T. B. DAVIS (Vermont, University. Burlington), E. BOCK (Copenhagen, University, Denmark), E. KORNECKI, and R. H. LENOX Nature (ISSN 0028-0836), vol. 320, March 6, 1986, p. 67-70. refs
(Contract AF-AFOSR-84-0331; NIH-MH-35735; NSF BNS-82-09265)

Direct evidence for the existence of an ectoprotein kinase (one which uses extracellular ATP to phosphorylate proteins localized at the external surface of the plasma membrane) is presented, and endogeneous substrates for its activity at the surface of intact neural cells are demonstrated. The phosphorylation of one of these surface proteins is selectively stimulated during cell depolarization. In addition, neuronal cell adhesion molecules appear to be among the substrates of ectoprotein kinase activity. These results suggest a role for surface protein phosphorylation in regulating specific functions of developing and mature neurones. C.D.

A86-31833* Scripps Institution of Oceanography, La Jolla, Calif.
MICROPLANKTON SPECIES ASSEMBLAGES AT THE SCRIPPS PIER FROM MARCH TO NOVEMBER 1983 DURING THE 1982-1984 EL NINO EVENT
F. M. H. REID (California, University, Scripps Institution of Oceanography, La Jolla), C. B. LANGE (Museo Argentino de Ciencias Naturales, Buenos Aires, Argentina), and M. M. WHITE (California, University, Scripps Institution of Oceanography, La Jolla) Botanica Marina (ISSN 0006-8055), vol. 28, no. 10, 1985, p. 443-452. Previously announced in STAR as N85-21926. refs
(Contract DE-AT03-82ER-60031; NAGW-458)

A semiweekly sampling program at the Scripps Institution of Oceanography Pier was begun in 1983 during an El Nino event. Microplankton data for March to November 1983 show a temporal sequence of species assemblages of the 24 important taxa, with a residence time of 1 to 4 weeks. From March to early September, the assemblages consisted of typial neritic taxa. From mid-September to mid-November, the presence of oceanic warm-wave species was associated with positive temperature anomalies characteristic of the El Nino condition. During the period studied numerical abundances were low. Author

A86-32057* Chicago Univ., Ill.
BIOLOGICAL EXTINCTION IN EARTH HISTORY
D. M. RAUP (Chicago, University, IL) Science (ISSN 0036-8075), vol. 231, March 28, 1986, p. 1528-1533. refs
(Contract NAG2-237)

Virtually all plant and animal species that have ever lived on the earth are extinct. For this reason alone, extinction must play an important role in the evolution of life. The five largest mass extinctions of the past 600 million years are of greatest interest, but there is also a spectrum of smaller events, many of which indicate biological systems in profound stress. Extinction may be episodic at all scales, with relatively long periods of stability alternating with short-lived extinction events. Most extinction episodes are biologically selective, and further analysis of the victims and survivors offers the greatest chance of deducing the proximal causes of extinction. A drop in sea level and climatic change are most frequently invoked to explain mass extinctions, but new theories of collisions with extraterrestrial bodies are gaining favor. Extinction may be constructive in a Darwinian sense or it may only perturb the system by eliminating those organisms that happen to be susceptible to geologically rare stresses. Author

A86-32237* Illinois Univ., Urbana.
EUKARYOTIC RIBOSOMES THAT LACK A 5.8S RNA
C. R. VOSSBRINCK and C. R. WOESE (Illinois, University, Urbana) Nature (ISSN 0028-0836), vol. 320, March 20, 1986, p. 287, 288. refs
(Contract NSG-7044)

The 5.8S ribosomal RNA is believed to be a universal eukaryotic characteristic. It has no (size) counterpart among the prokaryotes, although its sequence is homologous with the first 150 or so nucleotides of the prokaryotic large subunit (23S) ribosomal RNA. An exception to this rule is reported here. The microsporidian Vairimorpha necatrix is a eukaryote that has no 5.8S rRNA. As in the prokaryotes, it has a single large subunit rRNA, whose 5-prime region corresponds to the 5.8S rRNA. Author

A86-32524
THE REGULATORY MECHANISMS OF BLOOD SUPPLY IN SKELETAL MUSCLES [MEKHANIZMY REGULIATSII KROVOSNABZHENIIA SKELETNYKH MYSHTS]
A. F. BLIUGER, ED. Riga, Izdatel'stvo Zinatne (Eksperimental'naia Meditsina: Morfologiia, Fiziologiia, Biokhimiia, Immunologiia, No. 19), 1985, 151 p. In Russian. No individual items are abstracted in this volume.

Regulatory mechanisms of circulation in the resting and active skeletal muscles are discussed, together with clinical problems connected with regulatory disorders. Papers are presented on functional correlators of adaptive changes in arterial vessels of skeletal muscles in subjects with chronic arterial hypertension; the dynamics of filling and emptying the lower limb veins; and morphofunctional muscular characteristics as a factor affecting the progress of the pressor reaction caused by muscle contraction under static regimen. Consideration is given to the effect of reinnervation of skeletal muscles on their fatigue and blood supply; the characteristics of the spiroergometric parameters in patients with initial coronary lesions; and the effect of longitudinal stretching of a skeletal muscle on its blood supply at rest and under isometric tetanus. Additional topics include the expression of reactive hyperemia in skeletal muscles of dogs injected intravenously with catecholamines; factors that disrupt the mechanisms of bloodflow redistribution in skeletal muscles; and taxonomic and regional factors of the muscle circulation. I.S.

A86-32697
ACTIVATION OF CHOLESTEROGENESIS UNDER THE EFFECT OF IONIZING RADIATION ON A LIVING BODY [OB AKTIVATSII KHOLESTEROGENEZA PRI VOZDEISTVII IONIZIRUIUSHCHEI RADIATSII NA ZHIVOTNYI ORGANIZM]
I. K. KOLOMIITSEVA (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, Ukrainian SSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 3-10. In Russian. refs

An analysis of results concerning the effects of ionizing radiation on the biosynthesis of cholesterol and incorporation of lipids into cellular membranes of rat tissues is presented. The collected evidence indicates that the increase of cholesterol biosynthesis in both radiation-sensitive cells (intestinal epithelium cells, lymphocytes, and thymocytes) and liver cells is among the earliest responses to body irradiation. A scheme showing the role of lipogenesis in the regenerative response to radiation is proposed, according to which, the damage of the radiosensitive cells triggers the onset of increased cholesterol synthesis in both the damaged cells and the liver cells. The increasing amounts of lipoproteins synthesized in the liver are released into the blood to supply additional material for the synthesis of cellular membranes in the radiation-damaged cells, promoting cellular division and tissue regeneration I.S.

A86-32698
INVESTIGATION OF MECHANISMS OF THE RADIOPROTECTIVE EFFECT OF AGONISTS OF CATECHOLAMINE RECEPTORS - INVOLVEMENT OF BOTH SUBTYPES OF ALPHA-ADRENORECEPTORS IN THE RADIOPROTECTIVE EFFECT [ISSLEDOVANIE MEKHANIZMOV RADIOZASHCHITNOGO EFFEKTA AGONISTOV KATEKHOLAMINOVYKH RETSEPTOROV - VKLIUCHENIE V RADIOZASHCHITNYI EFFEKT OBOIKH PODTIPOV ALPHA-ADRENORETSEPTOROV]
V. I. KULINSKII, A. D. KLIMOVA, V. G. IASHUNSKII, and T. V. ALPATOVA (Krasnoiarskii Gosudarstvennyi Meditsinskii Institut, Krasnoyarski, Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 11-16. In Russian. refs

The radioprotective effect of arylalkylamine and imidazole-based stimulators of alpha-adrenoreceptors and the effect of nonstimulating chemical analogs were evaluated in mice irradiated by a 7.5 GR dose of X-rays. Injection of alpha-receptor stimulators, affecting both alpha and alpha 2 receptors, as well as selective stimulators of either the alpha 1 subtype (mesaton) or alpha 2 subtype (clonidine) of the adrenoreceptors was shown to increase survival rate by four to forty times. In contrast, the nonstimulating chemical analogs of mesaton failed to protect mice. Possible intracellular mechanisms of the radioprotection exerted by both types of adrenoreceptor stimulators are discussed. I.S.

A86-32699
STUDIES OF RADIOPROTECTIVE PROPERTIES OF ADETURON AND POLYANION, APPLIED SEPARATELY AND IN COMBINATION [IZLUCHENIE PROTIOVOLUCHEVYKH SVOISTV ADETURONA I POLIANIONA V USLOVIIAKH SAMOSTOIATEL'NOGO I SOCHETANNOGO PRIMENENIIA]
M. I. MINKOVA, T. P. PANTEV, I. T. NIKOLOV, and M. TALASH (Meditsinska Akademiia, Sofia, Bulgaria; Orszagos Sugarbiologiai es Sugaregeszsegugyi Kutato Intezet, Budapest, Hungary) Radiobiologiia (ISSN 0033-8192), vol. 26, Jan.-Feb. 1986, p. 70-75. In Russian. refs

The radioprotective efficiency of polyanion and adeturon, injected separately and in combination, were studied in mice exposed to a lethal dose (8.0 GR) of gamma rays from Cs-135. The effect of the injection regimens was assessed according to values of the survival rate and the haemopoietic indices (weight and cellularity of spleen, cellularity of the bone marrow, and the numbers of peripheral leukocytes), determined at the intervals of 3, 10, 20, and 30 days after irradiation. Both compounds were effective, although the biometric protection coefficients were significantly higher for adeturon. Combined application did not enhance the protective effect. I.S.

A86-33070
ROLE OF DOPAMINERGIC SYSTEMS OF NEOSTRIATUM DURING THE ACTIVITY OF THE CENTRAL NERVOUS SYSTEM IN MAN AND ANIMALS [ROL' DOFAMINERGICHESKIKH SISTEM NEOSTRIATUMA V PROTSESSAKH VYSSHEI NERVNOI DEIATEL'NOSTI ZHIVOTNYKH I CHELOVEKA]
N. F. SUVOROV and G. IU. VOLYNKINA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 48-55. In Russian. refs

Simple and complex behavioral patterns in man and rats were analyzed in conditions of the surplus and deficiency of dopamine. In rats, the development of situational reactions and conditioned reflexes at levels of increasing complexity correlated linearly with the contents of dopamine in neostriatum and with the dose of injected dopamine. In noninjected rats, the development of complex reflexes was accompanied by the increased biosynthesis of neostriatum dopamine. The time and the number of errors in the performance of simple psychomotor tasks by patients with drug-induced Parkinsonism were comparable to those of normal subjects. Complex psychomotor activity, however, was impaired in these patients. It is concluded that the dopaminergic system is engaged only in psychomotor activities requiring the cooperation of cerebral cortex. I.S.

A86-33071
CORTICORETICULAR INTERACTIONS IN THE MECHANISMS OF REFLEXOTHERAPY [KORKOVO-RETIKULIARNYE VZAIMOOTNOSHENIIA V MEKHANIZMAKH REFLEKSOTERAPII]
R. A. DURINIAN (Tsentralnyi Nauchno-Issledovatel'skii Institut Refleksoterapii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 56-60. In Russian. refs

Functional interactions between reticular formations of the brain stem and the cerebral cortex during transmissions of stimuli are discussed, together with the role of these interactions in the methodology of reflexotherapy. The stimulation of various acupuncture loci situated above afferent collectors (e.g., on the surfaces of the head, face, and concha auriculae) increases the general tonicity of the organism, stimulating its vegetative-endocrine functions and immune systems, and removing the feeling of fatigue. More local, specific corticorecticular activation by means of drugs or physical stimuli induces specific reflex reactions controlled by the corticofugal system. I.S.

A86-33072
THE THEORETICAL PRINCIPLES OF ADAPTATION [TEORETICHESKIE OSNOVY ADAPTATSII]
I. A. SAPOV and V. S. NOVIKOV Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 78-82. In Russian. refs

The principle of adaptation is based on the inherited ability of an organism to maintain stable equilibrium with the environment and to make rapid adjustments in various physiological processes to accommodate environmental changes. The regulatory, energy-producing, and nonspecific components of the physiological adaptation complex are discussed. Activity of the central nervous system is believed to play the foremost role in physiological adaptation, correlating the environmental information with the internal activity of the organism and regulating other processes, including the energy-regulating activity of the sympathoadrenal system and the activity of nonspecific protective systems. I.S.

A86-33073
BLOOD TRANSPORT OF OXYGEN (THE ROLE OF ERYTHROCYTES) [TRANSPORT KISLORODA KROV'IU /ROL' ERITROTSITOV/]
O. I. MOISEEVA (AN SSSR, Institut Fiziologii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 93-103. In Russian. refs

The factors determining blood transport of oxygen and its utilization by body tissues are described. Environmental changes (i.e., by smoking or hyperventilation), erythrocyte numbers and shape, and the factors determining the affinity of hemoglobin to oxygen are discussed. Quantitative differences exhibited by various body organs under oxygen deficiency are noted. Special consideration is given to changes in the oxygen affinity of hemoglobin caused by genetically determined faulty hemoglobin chains and by variations in the availability of 2,3-diphosphoglycerate, as well as to the mechanisms of adaptation to these changes. Corrective therapeutic measures include oxygenotherapy in cases of impaired ability of lungs to deliver oxygen, and hemotransfusion in conditions of erythrocyte shortage. Elevated oxygen affinity caused by genetically determined faulty hemoglobin cannot be treated. I.S.

A86-33074
ANALYSIS OF THE FUNCTIONAL STRUCTURE OF THERMOGENESIS ON THE BASIS OF PHARMACOLOGICAL TESTS [OPYT ANALIZA FUNKTSIONAL'NOI STRUKTURY TERMOGENEZA NA OSNOVE FARMAKOLOGICHESKOGO TESTIROVANIIA]
L. A. IUDANOVA, R. P. VALOV, and V. V. KHASKIN (Institut Fiziologii, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, Jan. 1986, p. 109-115. In Russian. refs

The effects of noradrenaline and propranolol on total heat production and contractile thermogenesis were studied in cold-adapted and control rats and in lemmings caught on Wrangel Island. Oxygen consumption, rectal temperature, and the integrated

activity of the trapezius muscle were measured at different ambient temperatures. In rats, the regulatory and adaptive increases in heat production occur due to elevated noncontractile thermogenesis and to a significant extension of the adrenergically modulated fraction of contractile thermogenesis. Propranolol injections led to increases in noncontractile thermogenesis, which was 2.3 times greater in the cold-adapted rats than in the controls. In lemmings, the adaptability to cold is maintained chiefly by rapid activation of the beta-adrenergic control of chemical thermogenesis and causes no alterations in muscle energetics. I.S.

N86-23217 Defence Research Information Centre, Orpington (England).
DEMONSTRATION AND ROLE OF CHEMORECEPTION IN THE MARINE ZOOPLANKTON
S. A. POULET Jan. 1985 31 p refs Transl. into ENGLISH from Oceanis, vol. 10, no. 2, 1984 p 131-149
(DRIC-T-7456; BR94716) Avail: NTIS HC A03/MF A01

Information on chemoreception in zooplankton is reviewed. Examples which suggest that chemoreception is responsible for the survival of plankton organisms by regulating reproduction, locomotion, and nutrition are discussed. Author (ESA)

N86-23218*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 4 Final Report
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., R. TEETER, ed., and J. E. ROWE, ed. Feb. 1986 118 p refs
(Contract NASW-3676)
(NASA-CR-3922(04); NAS 1.26:3922(04)) Avail: NTIS HC A06/MF A01 CSCL 06C

The fourth issue of NASA's USSR Space Life Science Digest includes abstracts for 42 Soviet periodical articles in 20 areas of aerospace medicine and space biology and published in Russian during the last third of 1985. Selected articles are illustrated with figures and tables from the original. In addition, translated introductions and tables of contents for 17 Russian books on 12 topics related to NASA's life science concerns are presented. Areas covered are: adaptation, biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, cytology, developmental biology, endocrinology, exobiology, habitability and environmental effects, health and medical treatment, hematology, histology, human performance, immunology, mathematical modeling, metabolism, microbiology, musculoskeletal system, neurophysiology, nutrition, perception, personnel selection, psychology, and radiobiology. Two book reviews translated from the Russian are included and lists of additional relevant titles available in English with pertinent ordering information are given. Author

N86-23219# Yale Univ., New Haven, Conn.
USE OF MEMBRANE VESICLES AS A SIMPLIFIED SYSTEM FOR STUDYING TRANSPORT OF AUXIN Progress Report
M. H. GOLDSMITH 1985 2 p refs
(Contract DE-FG02-85ER-13337)
(DE86-002264; DOE/ER-13337/1) Avail: NTIS HC A02/MF A01

The accumulation of indoleacetic acid (IAA) inside microsomal vesicles depends on the presence of a pH gradient and is reversible when the (DELTA)pH is collapsed by ionosphores. Accumulation is stimulated by either napthylphthalamic acid or TIBA. The accumulation of IAA by the vesicles can be saturated. At concentrations of 1 microns or less, IAA, synthetic auxins, or auxin antagonists do not affect the pH gradient, but decrease the accumulation of (3)H-IAA, and therefore compete specifically for uptake. Concentrations of 10 microns and above, uptake of either the auxins or weak acids is sufficient to overcome the buffering capacity of the solution within the vesicles. The collapse of the pH gradient by such high concentrations affects uptake of either (3)H-IAA or (14)C-BA to similar extents and thus is nonspecific. DOE

N86-23220# Department of Energy, Washington, D. C.
ANNUAL REPORT AND SUMMARIES OF FY 1985 ACTIVITIES SUPPORTED BY THE DIVISION OF BIOLOGICAL ENERGY RESEARCH
Nov. 1985 48 p
(DE85-009132; DOE/ER-0147/3) Avail: NTIS HC A03/MF A01

The Biological Energy Research (BER) program of the Office of future energy-related biotechnologies are discussed. The study of green plants as producers of renewable resources is a key aspect of the program. Plant productivity encompasses a broad array of processes, integrated to form a complex whole, the producing plant. Another major aspect of the research program examines microbiological conversions that yield fuels and/or chemicals. These bioconversion processes can provide a substitute for fossil energy resources directly or through energy conserving measures in which biological mechanisms displace industrial energy input requirements (e.g., biological nitrogen fixation, recovery of key resources from dilute concentrations, and conversion of noxious waste products to usable materials carbon monoxide to organic acids). In each instance, the research is aimed at understanding the fundamental mechanisms of conversion rather than a description or optimization of a process. One hundred twenty-five projects are described with subject and investigator indexes. DOE

N86-23221# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES Annual Report, 5 Aug. 1984 - 25 Oct. 1985
W. R. ROGERS, J. H. LUCAS, G. T. MOORE, and J. L. ORR 1985 51 p
(Contract DE-AC02-80RA-50219)
(DE86-002587; DOE/RA-50219/T6) Avail: NTIS HC A04/MF A01

Operant behavioral methods have been used to assess the aversiveness of intense electric fields. One aspect of the aversiveness of a stimulus is the ability to act as a negative reinforcer. A negative reinforcer is a stimulus whose response contingent termination maintains behavior. Baboons were trained to perform an operant task to obtain food rewards, determined that the addition of an intense electric field did not disrupt performance, measured the background level of responding in the absence of any primary reinforcers, assessed the ability of electric field termination to maintain operant responding, and verified that the electric field could serve as a discriminative stimulus. DOE

N86-23222# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
8 Jan. 1986 119 p refs Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-002) Avail: NTIS HC A06

Research and development in Soviet life, biomedical, and behavioral sciences is reported. The different categories presented include: agrotechnology, biochemistry, biophysics, biotechnology, epidemiology, food technology, genetics, human factors engineering, imunology, marine mammals, medicine, microbiology, molecular biology, pharmacology and toxicology, physiology, public health, veterinary medicine, and virology.

N86-23223# Joint Publications Research Service, Arlington, Va.
BIOCHEMICAL MODELS FOR STUDY OF NERVE CELL PROCESSES
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 2 8 Jan. 1986 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow, USSR), 18 Sep. 1985 p 3
Avail: NTIS HC A06

Biochemical models for the study of nerve cells were developed to obtain knowledge of the human brain. Neurochemistry studies the most important processes in living organism that are connected with neural control, memory and thinking. To understand the mechanism of these processes means to recognize the form in

which the nervous system receives external and internal information and reacts to it. Vitally important substances were isolated and studied. The information makes it possible to develop preparations for treating diseases of the nervous system, new anesthetics, and artificial memory systems built according to biological principles. E.A.K.

N86-23224# Joint Publications Research Service, Arlington, Va.
INTERACTION OF ASIALOGLYCOPROTEIN RECEPTOR OF HEPATOCYTES WITH CHEMICALLY GALACTOSILATED ACID ALPHA-GLUCOSIDASE Abstract Only
N. K. BYSTROVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 3 8 Jan. 1986 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 994-996
Avail: NTIS HC A06

The interaction of a mouse hepatic asialoglycoprotein receptor with chemically galactosilated alphaglucosidase (AGC) was studied to determine the feasibility of using such receptors for introducing AGC into hepatic lysosomes. It was shown that binding was specific and predicated on the presence of the galactosyl residue in the AGC molecule. Various galactose-containing substances inhibited the binding to variable extent, with the greatest degree of inhibition exhibited by asialoorosomucoid. The EDTA inhibited binding by more than 79%, confirming the dependence of binding on the presence of calcium ions, a characteristic feature of asialoglycoprotein receptors. It is indicated that under in vitro conditions the receptor recognizes galactosilated AGC as a specific ligand, suggesting that such enzymes can be introduced in this way into hepatic parenchymal cells. This uggests a means of enzyme therapy in such cases as type II glycogenosis. E.A.K.

N86-23225# Joint Publications Research Service, Arlington, Va.
PROTEIN-PROTEIN INTERACTIONS IN SYSTEMS WITH SYNTHETIC POLYELECTROLYTES Abstract Only
A. L. MARGOLIN, S. F. SHERSTYUK, V. A. IZUMRUDOV, V. K. SHVYADAS, A. B. ZEZIN, and V. A. KABANOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 4 8 Jan. 1986 Transl. into ENGLISH from Doklady Akademii Nauk SSSR (Moscow, USSR), v. 284, no. 4, Oct. 1985 p 997-1001
Avail: NTIS HC A06

The efficiency of interaction of alpha-chymotrypsin (ACT) with its basic pancreatic inhibitor on the basis of kinetic data was assessed by using free ACT and ALT covalently linked to polyelectrolytes. The association rate constants in pH 7.5 phosphate buffer at 25 was determined and shows that for the free enzyme in solution, ACT-polymethacrylate complex, and for the CH-agarose linked preparation of ACT, the following values are calculated: 2.8 x 1/10,000, 18.0 x 1/10,000, and 1.4 x 1/10,000 M1/sec-1. The inhibition constants for the three versions of ACT were 3.60 x 10 to the 8th power, 0.40 x 10 to the 8th power and 26.0 x 10 to the 8th power M. It is shown that the methods of enzyme linkage to polyelectrolyte carrier and the nature of the carrier have a profound effect on the binding behavior of the enzyme, and that such facts can be used to alter enzyme behavior toward desired final effects. E.A.K.

N86-23226# Joint Publications Research Service, Arlington, Va.
EFFECT OF INTENSIVE VISIBLE LIGHT ON ACTIVITY OF GLUTATHIONE PEROXIDASE IN PIGMENTED EPITHELIUM OF EYE
N. R. VELIYEVA, E. Y. YUSIFOV, and S. V. MAMEDOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86=002) p 5-9 8 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk Azerbaydzhanskoy SSR (Baku, USSR), v. 41, no. 5, May 1985 p 24-27
Avail: NTIS HC A06

Functional visual damage caused by visible light was studied. The effect of bright light on glutathsione peroxidase (GP) and pigmented epithelium (PE) activity in the retina was investigated. It is shown that GP activity increases in the PE of a frogs eye in response to intense light, and it is suggested that this is associated with the adaptive response to intensified free radical oxidation reactions in the eye's tissues. The important role of GP in the PE is confirmed. E.A.K.

N86-23228# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF GENE BANK FROM COTTON PLANT CHLOROPLAST DNA FOI HC/MF
M. KARIMOV, G. V. AFANASYEVA, and N. I. MATVIYENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 16-21 8 Jan. 1986 refs Transl. into ENGLISH from Doklady Akademii Nauk Tadzhiksoy SSR (Dushanbe, USSR), v. 28, no. 3, Mar. 1985 p 175-178
Avail: NTIS HC A06

The development of model systems that could make it possible to express eukaryotic genes is discussed. The symbiosis of Agrobacterium tumefaciens in higher plants is used to insert foreign genes into the plants. The plasma genes that are located in the cytoplasm organelles of higher plants, particularly in the chloroplasts are examined. Chloroplast DNA has enough information for the synthesis of a number of protein structures, and its amplification level relies on the expression of its own DNA and foreign DNA altered by genetic engineering techniques. Ribosomal RNA genes of plastids and a large subunit of riboso-diphospate carboxylase are encoded by a chloroplast gene. The insertion of strong promoters into these genes and their supplemental modification, affects the level of photosynthetic activity in plant tissue. One of the stages in changing a genetic program of agricultural plants is the creation of a gene bank of chloroplast DNA. It is demonstrated that the enzyme method of isolating protoplasts from cotton plant leaves followed by mechanical lysis and the lysis of chloropplasts in the presence of proteinase k and supplemental purification on biogel A-50, results in the separation of high polymerchloroplast DNA. E.A.K.

N86-23237# Joint Publications Research Service, Arlington, Va.
EFFECT OF PLASMIDS ON VIRULENCE OF PSEUDOMONAS AERUGINOSA STRAINS IN MOUSE EXPERIMENTS Abstract Only
A. S. YANENKO, V. N. KRYLOV, Y. S. STANISLAVSKIY, and Y. V. KHOLODKOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 34 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 19-22
Avail: NTIS HC A06

The effect of plasmids on the virulence of P. aeruginosa PAO strain is reported. Antigen characteristics of P. aeruginosa strains were studied in agglutination reaction on glass with the aid of poly or monovalent agglutinating O-serums of 20 different types. The virulence of 21 strains was studied on white mice. It is shown that the plasmids in PAO strains reduced the virulence of the pathogen. The plasmids that reduce virulence were from various groups of incompatibility and coded various medical resistant determinants with various effects on the growth of P. aeruginosa. Mutations of rpm that stabilized RP4 support in PAO cells also reduced virulence significantly. Chromosome rpm mutations caused changes in cell surfaces of P. aeruginosa. E.A.K.

N86-23247# Joint Publications Research Service, Arlington, Va.
SEARCH FOR DNA HOST SPECIFICITY SYSTEMS IN SALMONELLA TYPHI Abstract Only
A. L. PASHENKOV, I. I. NIKOLSKAYA, T. G. NIGMATULLIN, and S. S. DEBOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 57 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1984 p 3-6
Avail: NTIS HC A06

Most specificity systems and their components-restriction and modification enzymes were studied. DNA host specificity systems (HSS) in Salmonella typhi, using O- and Vi-bacteriophages were examined. Reduced effectiveness in phage cultivation was regarded as evidence of a restriction system in a given race. During cloning

morphological features such as colony size and form, transparency and the size of negative colony centers and incomplete lysis were recorded. The 11 lines of Vi-phages and 6 lines of O-phages obtained are further classified according to size, transparency and titration potential. Test cross-titration showed DNA HSS in natural hosts and the test phages. It is shown that 10 strains among the titrated lines of S. typhi have DNA host specificity systems.
E.A.K.

N86-23249# Joint Publications Research Service, Arlington, Va.
CLONING AND EXPRESSION OF LEPTOSPIRA POMONA HEMOLYSIN GENE IN ESCHERICHIA COLI Abstract Only
A. A. DAYN, M. N. ROZINOV, T. A. GOLTSMAYER, V. N. GERSHANOVICH, and Y. G. CHERNUKHA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 66 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 7-10
Avail: NTIS HC A06

The cloning of the genes in E. Coli a approach to the study of microorganism pathogens is another The L. pomona, which in severe cases is accompanied by yellow jaundice, and its expression in E. coil was studied. Chromosome DNA of L. pomona was obtained by a Fisher-Lerman process, DNA phage by phenol extraction and plasmid DNA by alkaline extraction. Cloning involved a gene inventory of bank nd subsequent screening, using cosmides or vectors based on the lambda phage. Features of fragmentation and cloning are summarized. The recombinant phage carrying the hemolysine gene was selected from phage vector lambda l47.1, and also in the phoUC19 vector. Secretions of hemolysin in the culture of E. coli are not observed. E.A.K.

N86-23252# Joint Publications Research Service, Arlington, Va.
DISEASES IN CEMA COUNTRIES
V. PETRUNYA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86=002) p 78-80 8 Jan. 1986 Repr. from New Times (Moscow, USSR), no. 36, Sep. 1985 p 22-23
Avail: NTIS HC A06

The pooling of the efforts of medical specialists from several countries is outlined. The standing committee on cooperation in health services is an international organization which coordinates the need for organ transplants in East European countries. The commission has worked on 13 large-scale composite problems. Among these problems are cardiovascular diseases, malignant tumors, scientific elaboration and unification of methods and means of clinical laboratory diagnosis. Every participating country acts as coordinator of the work on one or another composite problem. Bulgaria coordintes effort in the field of labor hygiene and occupational diseases, Hungary in research in the standardization of medicines, the G.D.R.--in infectious diseases, and Poland--in maternity and child protection. Czechoslovakia is coordinator of work in transplantation of organs and tissues. E.A.K.

N86-23253# Joint Publications Research Service, Arlington, Va.
MODEL OF EXPERIMENTAL PIXUNA VIRUS INFECTION IN WHITE MICE
N. P. CHIZHOV and R. I. LUKYANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 91-93 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 214-215
Avail: NTIS HC A06

Use of experimental models of virus-infected animals is an important prerequisite of evaluating the spectrum of action of promising antiviral drugs. The development and use of new experimental models of virus infections comparable or similar in pathogenesis to human diseases are significant in the determination of the preventive and therapeutic effectiveness of antiviral drugs. The development of a nonlethal model of experimental infection evoked by Pixuna alpha-virus which is suitable in the evaluation of the effectiveness of antiviral drugs is discussed. The model of nonlethal disease in white mice which is evoked by Pixuna alpha-virus can be used to evaluate the effectiveness of antiviral preparations and interferon inducers. The models critera for evaluating the effectivenss of antiviral preparations are heir influence on viruse reproduction in the spleen and brain. E.A.K.

N86-23254# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL EVALUATION OF PATHOGENICITY OF DIFFERENT VARIANTS OF LASSA VIRUS
A. S. VLADYKO, L. Y. SURIKOVA, T. A. VOVK, I. A. CHEREDNICHENKO, and A. V. TOROP *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 454-457
Avail: NTIS HC A06

Lasso, Machupo and Khunin belong to the highly pathogenic group of the arenavirus family. Research is conducted with the less-pathogenic lymphocytic choriomeningitis (LCM) virus. One of the directions of research on arenavirus infections is concerned with the problems of the attenuation--acquisition of both nonpathogenic viruses and viruses with reduced pathogenicity. The characteristics (markers) by which the degree of attenuation of the infectious agent can be evaluated was examined. It is established, using LCM virus as an example, that a phenotypic characteristic such as plaque morphology can be used as such a marker. It was discovered that the color of plaques in viruses that do not evoke death of newborn mice differs from the color of plaques created by the initial virus. A dependence between plaque phenotype and pathogenicity is not discovered in LCM virus. The Lassa virus was used to demonstrate the presence of a dependence between plaque phenotype and pathogenicity. The possibility of reducing pathogenicity by conducting a number of passages of the virus in cell culture and in animals is accounted for. Plaque size serves as the phenotypic characteristic of attenuation of Lassa virus. E.A.K.

N86-23255# Joint Publications Research Service, Arlington, Va.
STANDARDIZATION OF CONDITIONS FOR MEASURING INTENSITY OF SPECIFIC FLUORESCENCE IN CONTINUOUS CELL CULTURES INFECTED WITH VARIANTS OF JAPANESE ENCEPHALITIS VIRUS Abstract Only
Y. N. CHEREDNICHENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 100 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 57-60
Avail: NTIS HC A06

Luminescent microscopy as a method for studying pathogenesis of human and animal viral infections is discussed. The dynamics of the intensity of imposed fluorescence of marked antibodies tied to the antigen of Japanese encephalitis in vitro were studied. Cells of various origins were tested a passive fluorescent antibody method. Procedures for standardization and perfection of methodology and statistical calculations are summarized. A direct linear correlation is found between pathogen activity of Japanese encephalitis and the intensity of imposed fluorescence of marked antibodies. Continuous Viro and L929 cell cultures are more suitable models for registering induced fluorescence than the HeLa line.
E.A.K.

N86-23257# Joint Publications Research Service, Arlington, Va.
METEOROLOGICAL ADAPTATION RESEARCH AT BIOLOGY INSTITUTE Abstract Only
V. N. CHERNYAVSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 108-109 8 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 26 Sep. 1985 p 3
Avail: NTIS HC A06

Natural mechanisms of anticipation of weather changes in animals and human beings, and effects of weather conditions on human behavior and working fitness were studied. A natural phenomenon, meteorological sounds noise of free atmosphere which is caused by turbulent motion of the air was discovered. The sound reflect the atmosphere properties in a certain area.

including the appearance of new air masses in the upper atmosphere. Living organisms unconsciously perceive these sounds, analyze them and modify their behavior accordingly. A hypothesis of human meteorological adaptation proposed that the organism perceives and remembers whole meteorological sound-images which occur at certain intervals in certain localities, and corresponding programs for the readjustment of functional systems of the organism. The biological forecasting mechanism may lead to the development of improved weather-forecasting methods and equipment. An acoustic weather-forecasting method was used in the Rostov-na-Donu area. A medical forecasting method using primary data, based on the meteorological-adaptation hypothesis was also developed. Ecological factors are considered in the forecasting and prevention of illness. E.A.K.

N86-23258# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
12 Mar. 1986 147 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-004) Avail: NTIS HC A07/MF A01

Progress in research and development in USSR life, biomedical, and behavioral sciences is reported. The following areas of interest are discussed: agrotechnology, biochemistry, biophysics, biochemistry, biotechnology, ecology, epidemiology, genetics, immunology, laser effects, marine mammals, medicine, microbiology, molecular biology, pharmacology and toxicology, physiology, public health, psychology, and virology.

N86-24184# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
US DEPARTMENT OF AGRICULTURE/CORPS OF ENGINEERS COOPERATIVE AQUATIC PLANT CONTROL RESEARCH. ANNUAL REPORT FOR FY 1983; CHEMICAL CONTROL TECHNOLOGY Final Report
T. K. VAN, K. K. STEWARD, A. O. JONES, R. D. CONANT, JR., and H. E. WESTERDAHL Sep. 1985 70 p
(AD-A161867; WES/MP/A-85-3) Avail: NTIS HC A04/MF A01 CSCL 06F

Of the several controlled release herbicide formulations evaluated in FY83, two monolithic polycaprolactone fibers containing fluridone have been found to have significant potential. These fibers, designed to maintain herbicide-plant contact over a period of four to 6 weeks, were proven effective in controlling hydrilla (Hydrilla verticillata Royle) at 2.2 kg a.i./ha (active ingredient per hectare) in flowing water in large outdoor aquaria. Under the same conditions, the commercial formulation Sonar 4AS provided no hydrilla control. Two silicate capsules of dichlobenil showed promising results in the laboratory and were selected for evaluations in large outdoor aquaria in which long-term control of hydrilla regrowth was assessed. Research concerning application of glyphosate indicated that decreasing carrier volume increased phytotoxicity of glyphosate to waterhyacinth, mainly by enhancing herbicide retention and penetration. A treatment of 1.7 kg a.e./ha (acid equivalent per hectare) glyphosate in 438 L/ha water carrier resulted in faster and longer lasting control than did 2.8 kg a.e./ha in 935 L/ha. Long-term effects from glyphosate on torpedograss in standing water were significantly reduced compared to activity achieved on ditchbanks. Studies with 14C-glyphosate indicated that herbicide translocation was impeded in standing water. Sulfumeturon at 0.02 kg a.i./ha completely eradicated waterhyacinth in a 0.07-ha pond in Fort Lauderdale. Residue analyses indicated that levels of 1.3 to 1.6 microgram/L sulfumeturon were present in water 24 hr after application; then decreased rapidly. GRA

N86-24185# National Academy of Sciences - National Research Council, Washington, D. C. Commission on Life Sciences.
STUDY OF BIOTECHNOLOGY APPLIED TO RESEARCH AND DEVELOPMENT
8 Jan. 1985 43 p
(Contract N00014-83-G-0024)
(AD-A161877) Avail: NTIS HC A03/MF A01 CSCL 15B

This report contains summaries of a conference on biosensors, along with the deliberations of the Commitee on Biotechology Applied to Naval Needs. For the purposes of this report, biosensors are defined as devices that utilize some principles or elements of biology, broadly defined, to generate a signal in response to a specific material substance or condition. The committee considered that the appropriate areas of biology to consider were the study of receptors, enzymology, the use of DNA as a detector, immunologly, and the development of synthetic analogs to the relevant natural biological reactions. In contrast to a recent report prepared by the NRC's Board on Army Science and Technology, entitled Assessment of Chemical and Biological Sensor Technologies, which was written in response to a very narrowly and sharply defined charge, the present report focuses on basic biology relevant to biosensors. GRA

N86-24186# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
CLONING AND ANALYSIS OF GENES FOR ANTHRAX TOXIN COMPONENTS
S. H. LEPPLA, D. L. ROBERTSON, S. L. WELKOS, L. A. SMITH, and M. H. VODKIN 29 Aug. 1985 6 p
(Contract S18-06)
(AD-A161901) Avail: NTIS HC A02/MF A01 CSCL 06O

Genetic analysis and DNA cloning techniques have been used to study the plasmids and genes which determine synthesis of the three protein components of anthrax toxin. After plasmid curing and transfer experiments showed that all three genes were probably located on the large B. anthracis plasmid pX01, DNA libraries of pX01 DNA were constructed. Five colonies containing at least part of the lethal factor gene and six colonies containing protective antigen DNA were identified, and their plasmids were mapped by restriction enzyme digestion. The absence of an equal number of edema factor (EF) recombinants was attributed to the possibility that the EF adenylate cyclase is toxic to the host E. coli.
Author (GRA)

N86-24187# Army Medical Research Inst. of Infectious Diseases, Fort Detrick, Md.
IDENTIFICATION OF VACCINE RESISTANT ISOLATES OF BACILLUS ANTHRACIS
S. F. LITTLE and G. B. KNUDSON 13 Nov. 1985 23 p
(AD-A162002) Avail: NTIS HC A02/MF A01 CSCL 06M

Several strains of Bacillus anthracis have been reported previously to cause fatal infection in immunized guinea pigs. In this study, guinea pigs were immunized with either a protective antigen vaccine or a live Sterne strain spore vaccine, then challenged with virulent B. anthracis strains isolated from various host species from the United States and foreign sources. The authors concluded that antibodies to toxin components may not be sufficient to provide protection against all strains of B. anthracis, and that other antigens may play a role in active immunity. As a practical matter, it follows that the efficacy of anthrax vaccines must be tested by using vaccine-resistant isolates if protection against all possible challenge strains is to be assured. GRA

N86-24188# Naval Ocean Systems Center, San Diego, Calif.
THE EFFECTS OF BIS (TRI-N-BUTYLTIN) OXIDE ON THREE SPECIES OF MARINE PHYTOPLANKTON Final Technical Report, Jun. - Jul. 1982
S. M. SALAZAR May 1985 19 p
(Contract DA PROJ. Z08-29; DA PROJ. ZR0-0001)
(AD-A162115; NOSC/TR-1039) Avail: NTIS HC A02/MF A01 CSCL 07B

The effects of three concentrations of bis (tri-n-butyltin) oxide (TBTO) 1.5, 3.0, and 6.0 ppb) on three species of marine

phytoplankton were assessed. Parameters measured were in vivo fluorescence and DCMU induced fluorescence. Fluorescence ratios were calculated from these values. The effects of TBTO exposure varied considerably from species to species. Gymnodinium splendens was the most sensitive, affected by all concentrations of TBTO. Dunaliella sp. demonstrated inhibition of growth at 3.0 and 6.0 TBTO after 3 days. No measurable effects were detected for Phaedactylum tricornutum at any of the TBTO exposures. These data indicate the effect of TBTO on marine phytoplankton may be species specific. GRA

N86-24189# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

THE EFFECTS OF KETAMINE ON RHESUS MONKEY SKELETAL DYNAMICS

K. N. SWENSON, K. C. SMITH, C. M. OLOFF, and M. E. SOUDER Sep. 1985 52 p

(Contract AF PROJ. 723-1)

(AD-A162848; AAMRL-TR-85-060) Avail: NTIS HC A04/MF A01 CSCL 06O

Four young male Rhesus monkeys were exposed to intramuscular injections of ketamine anesthetic (15 mg/kg) on eight selected days of a 28 day experiment. The subjects were dosed with bone labeling compounds to determine the effect ketamine had on bone modeling/remodeling dynamics. Trabecular bone sections of T sub 9 and L sub 4, and cortical bone sections of proximal femur and midshaft femur were used for histomorphometric analysis. Urine creatinine and calcium, and serum alkaline phosphatase and calcium levels were determined. Vertebral centrum compression tests were conducted on selected thoracic and lumbar levels. Stiffness, ultimate load and modulus showed significant increases in the ketamine exposure group. The results of the trabecular histomorphometry showed a possible increase in mineralization lag time or slower mineralization. Cortical bone histomorphometry could indicate activation of the skeletal system. The experimental results lead to the conclusion that something affected the mechanical strength parameters and the bone remodeling dynamics of the ketamine exposure group. It is unclear as to whether these differences are strictly due to ketamine as stress and age difference were other influencing factors. GRA

N86-24190# California Univ., Berkeley. Lawrence Berkeley Lab.

BIOLOGICAL EFFECTS AND PHYSICAL SAFETY ASPECTS OF NMR IMAGING AND IN VIVO SPECTROSCOPY

T. S. TENFORDE and T. F. BUDINGER Aug. 1985 60 p refs Presented at the American Association of Physicists in Medicine Summer School, Portland, Ore., 4 Aug. 1985

(Contract DE-AC03-76SF-00098)

(DE86-002966; LBL-20053; CONF-8508145-1) Avail: NTIS HC A04/MF A01

An assessment is made of the biological effects and physical hazards of static and time-varying fields associated with the NMR devices that are being used for clinical imaging and in vivo spectroscopy. A summary is given of the current state of knowledge concerning the mechanisms of interaction and the bioeffects of these fields. Additional topics that are discussed include: (1) physical effects on pacemakers and metallic implants such as aneurysm clips, (2) human health studies related to the effects of exposure to nonionizing electromagnetic radiation, and (3) extant guidelines for limiting exposure of patients and medical personnel to the fields produced by NMR devices. On the basis of information available at the present time, it is concluded that the fields associated with the current generation of NMR devices do not pose a significant health risk in themselves. However, rigorous guidelines must be followed to avoid the physical interaction of these fields with metallic implants and medical electronic devices. DOE

N86-24191# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany). Space Div.

STUDY OF BIOSAMPLE PRESERVATION, HANDLING, AND OBSERVATION FACILITIES Final Report

Paris ESA May 1985 199 p refs Prepared in cooperation with Brunel Univ., Uxbridge, England Original contains color illustrations

(Contract ESTEC-5655/83-NL-PR)

(ESA-CR(P)-2126) Avail: NTIS HC A09/MF A01

An autonomous facility for biology experiments in space, to be flown on platforms such as EURECA is proposed. It is a modular, multiuser facility, capable of 6 months automated operation. It includes an experiment area for specimen growth in 1 g and micro-g, sample storage and transport facilities, and observation and data processing units. Tests on breadboards of critical subsystems (culturing, workstation, containers, cameras) show the feasibility of the design. Author (ESA)

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-29855#

HELICOPTER-CONTROL-REFERENCED STRENGTH CAPABILITIES OF SMALL INDIVIDUALS

A. W. SCHOPPER and G. R. MASTROIANNI (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 47-54. refs

An evaluation is made of helicopter control-referenced force exertion capabilities in a sample of U.S. Army males and females, with a view to the reevaluation of anthropometric criteria. These data were compared with the values cited as upper force limits for the design of helicopter controls. Due to their small size, these females of 152-167 cm stature and males of 159-167 cm stature represent the portion of the population least likely to meet 1961 strength limits for nonstandard flight maneuvers. Ten percent of the males and 27 percent of the females evaluated failed to achieve existing control force design limits, especially in the downward direction of collective control. O.C.

A86-30169

AEROSOL DEPOSITION ALONG THE RESPIRATORY TRACT AT ZERO GRAVITY - A THEORETICAL STUDY

B. E. LEHNERT, D. M. SMITH, L. M. HOLLAND, M. I. TILLERY (Los Alamos National Laboratory, NM), and R. G. THOMAS (Los Alamos National Laboratory, NM; DOE, Office of Health and Environmental Research, Washington, DC) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 671-677. DOE-supported research. refs

Attention is given to the results of a study conducted to predict the ways in which particle deposition in the human respiratory tract at zero gravity may differ from that on earth. The aerosol deposition model of the Task Group on Lung Dynamics (1966) was used to assess the regional deposition of particles ranging from 0.01 to 10.0 microns in diameter at particulate density values of 1 and 4, during simulated tidal breathing as well as breathing during moderate-to-heavy exercise. The results suggest that the gas exchange regions of the lungs of space travelers and residents are afforded some protection, relative to their earthbound counterparts, against particle deposition in the absence of gravity; a reduction by a factor of approximately 2 to 10 is noted in collection efficiency for the case of particles greater than 0.5 microns in diameter. Deposition along the tracheobronchial tree is not significantly altered in the absence of gravity, indicating that airway

sites contributing to this structure remain susceptible to inhaled aerosols. O.C.

A86-30381#
CRITICAL IMPACT AND ACCELERATION LOADING TO THE HEAD
W. GOLDSMITH (California, University, Berkeley) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-21 to S-24. refs
(Contract NIH-5-R01-AM-18284)

Various loads to the human head are of a few milliseconds duration are surveyed including nonpenetrating blunt impact to the cranium and rotational acceleration loading. Head impact during sporting events is also discussed along with loads experienced in a cannon-bearing military vehicle, whereby gunners are subjected to a direct blow to the head by gun recoil as well as to a wave transmitted through the seat. Experiments that would identify the threshold of very serious, frequently fatal cranial injury caused by blunt impact to the human head, were conducted using extrapolation, scaling, modeling and by extension of impact data from human replicas. Previous assertions equating skull fracture with concussion were proven invalid, as results indicated that skull fracture requires twice the acceleration levels for neutral trauma. It was noted that brain damage can also be caused by indirect loading and that primates exhibit a higher concussion tolerance when exposed to a given level of linear acceleration regardless of simultaneous angular acceleration. K.K.

A86-30382#
IS SPACE SICKNESS A FORM OF MOTION SICKNESS?
H. L. BORISON (Dartmouth College, Hanover, NH) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 12-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-25 to S-27. refs

A comparison is made of space sickness and terrestrial motion sickness with respect to stimulus properties, response properties and contributing mechanisms. Observations are restricted, as far as possible to spontaneous occurrences of space sickness free from extraneously occurrences of space sickness free from extraneously imposed test motions. Likewise, terrestrial motion sickness is examined under the simplest conditions for its evocation. Convincing differences are evident in some of the stimulus and response properties of the two sickness syndromes while others are equivocal. Possible mechanisms of space sickness are all unproved. It is concluded that decisive experiments on the vestibluar system and the emetic reflex mechanism must be performed in microgravity to erase reasonable doubts that space sickness is a form of motion sickness. Author

A86-30383#
EFFECTS OF GRAVITY ON THE FLUID BALANCE AND DISTRIBUTION IN MAN
D. LINNARSSON, B. TEDNER, and O. EIKEN (Karolinska Institutet, Stockholm, Sweden) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-28, S-29. refs

Marked fluid shifts have been observed during space flight and simulated microgravity. Three components can be identified: First, a rapid cephalad blood shift; second, a shift of extravascular fluids from the legs within hours; and third, a net loss of water within days. We have investigated the second phase in seven healthy men during 7 deg HDT. Segmental fluid distribution and changes in total body fluids were monitored by means of a tetrapolar impedance technique. Leg fluid volume was reduced as an exponentially decaying function of time, with time constants of 25-50 minutes. No simultaneous increase in the fluid volume of the trunk could be detected. This indicates that the fluid removed from the legs then is to be found in the blood. Our results also show the feasibility of the impedance technique to monitor fluid changes during microgravity. Author

A86-30384#
VOLUME REGULATING HORMONES
C. GHARIB, G. GAUQUELIN, G. GEELEN (Lyon I, Universite, Lyons, France), J. L. MAUROUX, A. GUELL (Centre Hospitalier Universitaire, de Rangueil, Toulouse, France) et al. (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-30 to S-33. Research supported by DIGITAL France, CNES, DRET, and CNRS. refs

The decrease of hydrostatic pressure during space flights (microgravity state) or simulations of weightlessness (by immersion, bedrest or head-down tilt) results in body fluid shift and an engorgement of the central circulation where mechanoreceptors involved in plasma volume regulation are located. Their activation induces the initial (first hours) hormonal response with a decrease in plasma vasopressin, renin and aldosterone and an increase of natriuretic factor (Gauer reflex). The long term effects of weightlessness are linked to electrolyte disturbances, mainly a sodium loss which induces an increase in plasma renin and aldosterone and an amplification of the circadian rhythm renin activity. The discrepancies between the results of different studies could be explained by several factors (training level of subjects, diet, the subjects posture during the control period). Author

A86-30385*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
FLUID AND ELECTROLYTE CONTROL IN SIMULATED AND ACTUAL SPACEFLIGHT
C. S. LEACH and P. C. JOHNSON, JR. (NASA, Johnson Space Center, Houston, TX) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-34 to S-37. refs

Effects of microgravity on body fluid distribution and electrolyte and hormonal levels of astronauts have been studied since the early manned space missions. Bedrested subjects have been used as controls to separate effects of microgravity from those of hypokinesia. These investigations have led to documentation of the physiological effects of spaceflight and to a unified theory of response to microgravity. During flight, crewmembers have decreased thirst and a net loss of body water, sodium, and potassium. These changes seem to be initiated by passive transfer of extracellular fluid resulting in increased central venous pressure (CVP), to which the homeostatic mechanisms respond. A new equilibrium state is maintained during flight; it does not change in response to negative calcium and nitrogen balances during flight. On reexposure to gravity, profound water and salt retention occurs to replete extracellular fluid. Attempts to avoid cardiac deconditioning by repleting water and salt before leaving microgravity have somewhat ameliorated postural hypotension but have had little effect on CVP, cardiac chamber size or electrolyte dynamics. Author

A86-30386*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
MECHANISMS FOR NEGATIVE WATER BALANCE DURING WEIGHTLESSNESS IMMERSION OR BED REST?
J. E. GREENLEAF (NASA, Ames Research Center, Moffett Field, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-38, S-39. refs

Results of bedrest and water immersion studies are of interest when formulating an hypothesis to explain inflight changes in water and electrolyte metabolism. A comparison of the two techniques is made, and it is found that the time course of fluid-electrolyte responses with bedrest occur more slowly than during weightlessness and faster with immersion. Hence, the head-down bedrest is the more appropriate model for simulation studies. The

facts lead to the following hypothesis: Because of the head-ward shift of fluid , there is a transient elevation of central venous pressure upon reaching weightlessness that is not sufficiently intense to significantly activate the vasopressin-diuresis mechanism. But the increased pressure is of significant intensity to release atrial natriuretic peptides. A hypotonic fluid moving into the cells contributes to edema and inhibits thirst. In this manner, astronauts gradually lose body water as a result of slightly increased urinary sodium coupled with decreased fluid intake. These responses continue until a new fluid-electrolyte steady state is attained at a reduced level of total body water. Author

A86-30387#
CARDIORESPIRATORY RESPONSES TO LOWER BODY NEGATIVE PRESSURE AND TILT TESTS AFTER EXPOSURE TO SIMULATED WEIGHTLESSNESS
V. P. KATUNTSEV, V. E. KATKOV, V. M. BARANOV, I. F. VIL-VILIAMS, and A. M. GENIN (Institut Mediko-Biologicheskikh Problem, Moscow, USSR) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-40 to S-42. refs

Experimental results are presented concerning the cardiorespiratory responses of healthy male volunteers to -30 mm Hg lower body negative pressure (LBNP) and tilt tests following 6-7 day exposure to simulated weightlessness. In the first series of experiments (LBNP) tests, the magnitude of the responses was significantly smaller than in the second (tilt tests). During LNBP tests there were no syncopal and presyncopal subjects, whereas during tilt tests all subjects developed presyncopic reactions with a decrease of blood pressure. Syncopic reactions were observed in three subjects during the filt tests. Symptoms of imminent syntilation accompanied by a marked decrease of PaCO2 were also observed. The role of extracardiac mechanisms of circulation regulation and arterial hypocapnia in the development of orthostatic intolerance is discussed in detail. I.H.

A86-30445#
CIRCADIAN VARIATION OF VOLUME AND CONCENTRATION OF ORTHOSTATICALLY SHIFTED FLUID
M. MOSER, F. VAUTI, H. PINTER, and T. KENNER (Graz, Universitaet, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-169, S-170. Research supported by the Oesterreichische Nationalbank.

The volume and density of the fluid shift due to postural change from supine to standing was measured for six male students at eight times of the day. Earlobe capillary blood samples were measured for blood and plasma density changes, and hematocrit; and the protein content was calculated. A minimum for all parameters was seen at six PM, and there is a variation of -21 percent to +13 percent from the mean of 7.4 percent of the blood volume. The filtrate density of the shifted fluid, determined by the 'mechanical oscillator technique', varied from 1007.6 g/l (O AM) to 1004.5 g/l (6 PM). An elevated filtration permeability during the night and a decreased permeability in the late afternoon are observed, pointing to an increased lower body filtration coefficient during the night hours. R.R.

A86-30446#
DAY COURSE OF BLOOD AND PLASMA DENSITY IN RELATION TO OTHER HEMATOLOGICAL PARAMETERS
F. VAUTI, M. MOSER, H. PINTER, and T. KENNER (Graz, Universitaet, West Germany) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-171, S-172. Research supported by the Oesterreichische Nationalbank. refs

The mechanical oscillator technique (MOT) was used to investigate the relationship between blood composition and intercompartmental fluid shifts with respect to gravity and daytime dependence. In six healthy young men, capillary blood was sampled from both earlobes in supine and upright head-up tilt position at eight different times of day under conditions of normal daily activity. The results demonstrated pronounced circadian alterations of hematological parameters, including values for hemoglobin, hematocrit, erythrocyte count, leucocyte count, and mass density of whole blood and plasma, in supine as well as in standing position. Lower amplitudes occurred in standing than in reclined position. It is concluded that MOT is a very useful method for studying fluid distributions in the cardiovascular system. C.D.

A86-30448#
MICROVASCULAR FLOW ADJUSTMENTS WITH POSTURAL CHANGES IN HUMANS
P. N. SFAKLANOS, A. R. HARGENS, and W. H. AKESON (California, University; USVA, Medical Center, San Diego, CA) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-175, S-176. USVA-supported research. refs
(Contract NIH-AM-25501)

Studies of both simulated and actual weightlessness document significant regional fluid shifts within the body. One manifestation of weightlessness is the accumulation of fluid in the face as a result of the fluid shift away from lower extremities. Blood flow in lip capillaries was investigated in order to determine the relationship between microvascular flow and varying degrees of postural inversion. The head-down tilt posture (reversal of the normal hydrostatic pressure gradient between head and heart) is commonly used to simulate weightlessness in humans. Author

A86-30678
PLASMA LACTATE AND VENTILATION THRESHOLDS IN TRAINED AND UNTRAINED CYCLISTS
J. SIMON, J. L. YOUNG, D. K. BLOOD, K. R. SEGAL, R. B. CASE (Columbia University, New York) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 777-781. refs

A86-30679
EFFECT OF ELEVATED FFA ON CARBOHYDRATE AND LIPID OXIDATION DURING PROLONGED EXERCISE IN HUMANS
E. RAVUSSIN, C. BOGARDUS, K. SCHEIDEGGER, B. LAGRANGE, E D. HORTON (Vermont, University, Burlington) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 893-900. refs
(Contract NIH-R01-AM-26317; NIH-RR-109)

A86-30680
PHYSIOLOGICAL CHANGES IN HEMOSTASIS ASSOCIATED WITH ACUTE EXERCISE
M. E. WHEELER, G. L. DAVIS, W. J. GILLESPIE, and M. M. BERN (Northeastern University; New England Deaconess Hospital, Boston, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 986-990. Research supported by General Diagnostics. refs
(Contract NIH-RR-07143)

Exercise-induced changes in blood lactate, 2,3-diphosphoglycerate, fibrinolytic activity (FA), and hemostatic activities of factor VIII complex subunits were investigated, using human subjects exercising to maximum effort on a treadmill. All parameters, which were analyzed before, immediately postexercise (IP), and 8 min postexercise, were found to significantly increase postexercise. A positive correlation was found between the IP lactate with the IP FA and factor VIII coagulant activity, and the correlation was strengthened by including the preexercise value of blood high-density lipoprotein (HDL) concentration. It is suggested that the IP lactate concentration and the preexercise HDL content may be useful components of a predictive index for identifying individuals with fibrinolytic system impairments. I.S.

A86-30681
SOMATOSTATIN INHIBITS THE VENTILATORY RESPONSE TO HYPOXIA IN HUMANS
D. L. MAXWELL, P. CHAHAL, K. B. NOLOP, and J. M. B. HUGHES (Royal Postgraduate Medical School, London, England) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 997-1002. Research supported by the Wellcome Trust. refs

The effect of a 90-min infusion of somatostatin on ventilation and the ventilatory responses to hypoxia and hypercapnia were investiated in human subjects by measuring minute ventilation, arterial O2 saturation, and arterial PCO2. Somatostatin greatly attenuated the hypoxic response and caused a small fall in resting ventilation, but did not affect the hypercapnic response. When the progressive ventilatory responses and overall metabolism were measured, the somatotoxin responses were found to be similar (mean fall in hypoxic response but no change in hypercapnic response), and no changes in overall O2 consumption or in CO2 production were observed. The results show a hitherto-unsuspected inhibitory potential of somatostatin on the control of breathing; the sparing of the hypercapnic response is suggestive of an action on the carotid body but does not exclude a central effect. I.S.

A86-30684
REMARKABLE METABOLIC AVAILABILITY OF ORAL GLUCOSE DURING LONG-DURATION EXERCISE IN HUMANS
N. PALLIKARAKIS, B. JANDRAIN, F. PIRNAY, F. MOSORA, M. LACROIX (Liege, Universite, Belgium) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, March 1986, p. 1035-1042. Research supported by the Fonds de la Recherche Scientifique Medicale, FNRS, and FRFC. refs

A86-30893
COMPLEX APPROACH TO THE STUDY OF ADAPTIVE SYSTEMIC REACTIONS AND FUNCTIONAL STATES IN MAN. I - THE TIME FACTOR IN THE FORMATION OF SUBCOMPLEXES OF SYSTEMIC PHYSIOLOGICAL INDEXES OF FUNCTIONAL STATE DYNAMICS, AND THE INSTRUMENTATION USED IN THE STUDY [KOMPLEKSNYI PODKHOD K IZUCHENIIU ADAPTIVNYKH SISTEMNYKH REAKTSII I FUNKTSIONAL'NYKH SOSTOIANII CHELOVEKA. I VREMENNOI FAKTOR V FORMIROVANII SUBKOMPLEKSOV SISTEMNYKH FIZIOLOGICHESKIKH POKAZATELEI DINAMIKI FUNKTSIONAL'NYKH SOSTOIANII I APPARATURNOE OBESPECHENIE ISSLEDOVANII]
V. A. ILIUKHINA and S. G DANKO (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 25-37. In Russian. refs

The complex method used to study the functional stability and adaptive systemic reactions in man is based on correlating the dynamics of ultraslow physiological processes registered in the brain (such as the omega potential and ultraslow potential oscillations in the tau and zeta waves) with changes in vegetative indices and in the adaptive psychological reactions of memory, attention, and emotional display. A multiparameter instrumental system, which permits simultaneous registration of the ultraslow reactions and of the correlated adaptive psychophysiological reactions is described. The method is illustrated by a study of the effect of nacom in patients with Parkinsonism. I.S.

A86-30894
NEURONAL RESPONSES AND THE EVOKED POTENTIALS IN SUBCORTICAL STRUCTURES OF THE HUMAN BRAIN DURING VISUAL RECOGNITION. II - THE EFFECT OF STIMULI RELEVANCE ON THE EVOKED NEURONAL RESPONSES [REAKTSII NEIRONOV V VYZVANNYE POTENTSIALY V PODKORKOVYKH STRUKTURAKH MOZGA CHELOVEKA PRI ZRITEL'NOM OPOZNANII. II - VLIIANIE RELEVANTNOSTI STIMULOV NA VYZVANNYE REAKTSII NEIRONOV]
IU. D. KROPOTOV and V. A. PONOMAREV (Institut Eksperimental'noi Meditsiny, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 58-64. In Russian. refs

A86-30895
THE EFFECT OF INTENSE MENTAL WORK UNDER STRESS ON CARDIAC ACTIVITY, HEMODYNAMICS, AND BRAIN CIRCULATION [VLIIANIE NAPRIAZHENNOI UMSTVENNOI RABOTY V STRESSORNYKH USLOVIAKH NA SERDECHNUIU DEIATEL'NOST', GEMODINAMIKU I KROVOOBRASHCHENIE GOLOVNOGO MOZGA]
B. M. FEDOROV, E. N. STRELTSOVA, T. V. SEBEKINA, and T. M. SINITSYNA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 65-71. In Russian. refs

A86-30896
THE ROLE OF HORMONAL CHANGES IN THE DEVELOPMENT OF MOTION SICKNESS IN MAN [O ROLI IZMENENII GORMONAL'NOGO STATUSA CHELOVEKA V RAZVITII BOLEZNI DVIZHENIIA]
A. I. GRIGOREV, I. A. NICHIPORUK, and G. S. ARZAMAZOV Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 76-81. In Russian. refs

Clinical symptoms of experimentally induced motion sickness were correlated with measured blood contents of adrenocorticotropin, somatotropin, vasopressin, prolactin, cortisone, and aldosterone. The onset of motion sickness was found to coincide with sharp increases in somatotropin, vasopressin, and prolactin in highly susceptible but not in resistant subjects. The endocrine reactions indicate the involvement of the hypophyseal-hypothalamic system in the adaptive reactions expressed by the motion sickness syndrome. The role of the endogenous opiate-like compounds, such as enkephalins, in interconnecting the endocrine system and the neuromediating system is suggested. I.S.

A86-30898
THE ALLEVIATING EFFECT OF ARBITRARY MOVEMENTS ON THE VESTIBULOMOTOR [OBLEGCHAIUSHCHEE DEISTVIE PROIZVOL'NYKH DVIZHENII NA VESTIBULOMOTORNUIU REAKTSIIU]
B. N. SMETANIN, V. IU. SHLYKOV, and M. P. KUDINOVA (AN SSSR, Institut Problem Peredachi Informatsii, Moscow, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 133-140. In Russian. refs

The effects of various arbitrary movements on manifestations of the vestibulomotor reaction were studied in human subjects receiving electrical stimuli to the vestibular apparatus. Certain body maneuvers, such as rapid sideward head movements, forward body bending, or arm swinging, had little or no effect. On the other hand, the destabilizing movements specifically associated with spatial displacements of the body and with postural rearrangements, such as rapid squatting, rapidly repeated rising on one's toes, or walking in place, incerased the compensatory motor reaction and lowered the threshold of its appearance. The observed effect was not caused by induced instability per se but had to do with the volitional initiation of the destabilizing movements. I.S.

A86-30899
DYNAMICS OF THE SALIVARY ELECTROLYTE COMPOSITION AND RENAL EXCRETORY FUNCTION DURING HUMAN ADAPTATION TO AN ALTERED GASEOUS ENVIRONMENT [DINAMIKA ELEKTROLITNOGO SOSTAVA SLIUNY I EKSKRETORNOI FUNKTSII POCHEK PRI ADAPTATSII CHELOVEKA K IZMENENNOI GAZOVOI SREDE]
N. A. AGADZHANIAN, A. I. ELFIMOV, and Z. B. MININA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Jan.-Feb. 1986, p. 157-164. In Russian. refs

The effects of increasing atmospheric contents of O2 and CO2 on the renal excretory function and on salivary electrolyte composition were studied in men kept in a controlled atmosphere. Elevated CO2 has led to increases in salivary potassium, with hyperoxia reinforcing the effect, while the kidney water excretion was inversely proportional to atmospheric oxygen content. Hypercapnia was seen to adversely affect renal ion and osmoregulating functions, but both of these could be normalized

by increasing the atmospheric oxygen to 29 percent. Atmospheric changes have also affected the circadian rhythms of diuresis and electrolyte concentrations. I.S.

A86-31150
CATCHING ZZZS IN ZERO-G
D. PINE Space World (ISSN 0038-6332), vol. W-2-266, Feb. 1986, p. 27-29.

A discussion on zero-g sleep over the history of the space program is presented. On the early flights, astronauts slept in their seats, whereas beginning with Apollo 7, they could stretch out and free float in sleep restraints. Shuttle improvements include bunks which help block out noise. An ESA designed restraint with inflatable tubes on the exterior helps prevent the feeling of free fall during sleep. Early experiments on reorganizing sleep/wake patterns were unsuccessful. A Skylab test found that stage-three sleep increased during the flight but decreased on return home, and that REM increased only after return home, indicating that the astronauts were still adapting to space. This test also indicated that the crew did not awake more frequency than normal in space, despite complaints of insomnia. R.R.

A86-31223
CORRELATION OF CONSTANT FLOW RATE WITH FREQUENCY SPECTRUM OF RESPIRATORY SOUNDS WHEN MEASURED AT THE TRACHEA
C. S. LESSARD and W. C. WONG (Texas A&M University, College Station) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, April 1986, p. 461-463. refs
(Contract F33615-83-F-0602-001)

The relationship between the spectral composition of respiratory sounds and respiratory flow rates was studied in normal subjects during inspiration and expiration at six constant flow rates. Respiratory sounds were measured with an electronic stethoscope placed at the anterior cervical triangle, while the flow rates were measured by a pneumotachometer. From each sound spectrum, the variable parameters of the mean frequency of the power spectra (MPF), the frequency of the maximum power, and the highest frequency at which the power in the spectrum is at least 10 percent of maximum power, were calculated. The expiratory spectra had higher frequency values than the inspiratory spectra. Of all variable parameters, only the MPF values were seen to increase linearly with increasing flow rate, and that only to the flow rate of 0.75 liter/s. Above the rate of 0.75 liter/s, all spectral parameters appear to level off during both inspiration and expiration. I.S.

A86-32875
DISTURBANCES IN THE NIGHT SLEEP STRUCTURE AND ORGANIZATION AND THEIR SIGNIFICANCE IN THE ADAPTIVE-RECUPERATION PROCESSES
A. A. VARBANOVA and I. M. STOILOVA (B'lgarska Akademiia na Naukite, Tsentralna Laboratoriia za Izuchavane na Moz'ka, Sofia, Bulgaria) Bolgarskaia Akademiia Nauk, Doklady (ISSN 0366-8681), vol. 38, no. 12, 1985, p. 1721-1724. refs

Night sleep was recorded as part of an evaluation of the adaptive capacity of man exposed to prolonged hyperbaric influences. The results obtained for 22 individuals, placed for a continuous period of time (7-30 days) under conditions of an increased atmospheric pressure corresponding to depths of 200-450 m, indicate that a complex of hyberbaric factors significantly affects the structure and organization, but not the total duration, of night sleep. A considerable decrease in rapid eye movement (REM) sleep and a decrease in slow-wave sleep (stages 3 and 4) occurs, up to a total lack of the 4th stage. The percentage of superficial sleep (stages 1 and 2) rises, and the normal distribution of the stages during the night hours is disturbed, with a lack of well-formed cycles. The normal tendency towards a gradual deepening of the sleep and elongation of the REM periods which complete the sleep cycle are not evident. The REM stage, when present, is markedly broken up and frequently removed to the second half of sleep. C.D.

A86-33459
NEUROMAGNETISM - THEORY, TECHNIQUES, AND MEASUREMENTS
R. ILMONIEMI Espoo, Helsinki University of Technology, Doctor of Technology Thesis, 1985, 49 p. Research supported by the Academy of Finland, Emil Aaltonen Foundation, Cultural Foundation of Finland, and Instrumentarium Science Foundation. refs

The genesis, calculation, measurement, and interpretation of neutromagnetic fields are discussed. Electromagnetic fields of biological origin are addressed, including the cellular basis for EMF, the postsynaptic and action potentials, the forward problem, piecewise homogeneous and cylindrically symmetric conductors, the spherically symmetric head model. The neuromagnetic inverse problem is examined, including the current space, the lead field, the best estimate concept, minimum norm estimates, and the current dipole model. The SQUID magnetometer is discussed, and a collection of abstracts of publications in the field of neuromagnetism is presented. C.D.

N86-23227# Joint Publications Research Service, Arlington, Va.
DISCOVERY REGARDING ELECTRON REDISTRIBUTION AMONG CELL MEMBRANES Abstract Only
I. NOVODVORSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 12 8 Jan. 1986 Transl. into ENGLISH from Izvestiya (Moscow, USSR), 27 Sep. 1985 p 3
Avail: NTIS HC A06

The transfer of electrons between individual membranes inside a cell and between cells in an organ or tissue. The process of redistribution of electrons between membranes combines all membranes into a single coordinated system. These chemical reactions are delayed and inhibited in a number of illnesses which involve changes in cells and constitute practical application of this discovery since it will help in the diagnosis of serious illnesses. E.A.K.

N86-23229# Joint Publications Research Service, Arlington, Va.
PRODUCTION OF GAMMA- AND ALPHA-INTERFERON BY HUMAN BLOOD LEUKOCYTES UNDER SUCCESSIVE INDUCTION CONDITIONS
T. G. ORLOVA, L. V. ZHDANOVA, M. N. SOLOYEVA, and L. M. MENTKEVICH *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 22-24 8 Jan. 1986 refs Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 2, Mar. - Apr. 1985 p 196-198
Avail: NTIS HC A06

Alpha and Gamma Interferons are produced by different blood cells--by B lymphocytes and T lymphocytes. This predetermines the possibility for simultaneous or successive induction of the same blood leukocytes by inducers eliciting formation of these types of interferon. When inducers interacting with different producer cells are used in this way, the interferon tolerance phenomenon is avoided. Successive induction means a savings of leukocytes, because the same cells can be used to obtain two yields of interferons. Favorable results in research on production of human gamma - and alpha-interferons involving successive use of gamma interferon inducers--phytohemagglutinin (PGA) and staphylococcal enterotoxin (SEA), and an alpha-interferon inducer--Newcastle disease virus (NDV)--are presented. It is concluded that the double successive induction method of the same human peripheral blood leukocytes allows yields of interferon from gamma and alpha interferons. E.A.K.

N86-23230# Joint Publications Research Service, Arlington, Va.
FARM ANIMALS AS SOURCE OF YERSINIOSIS Abstract Only
Y. N. KOLOS, I. N. GIUTOV, G. V. YUSHCHENKO, and V. I. DUNAYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 25-26 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 77-80
Avail: NTIS HC A06

The role of farm animals as sources of yersiniosis in humans and as possible carriers was studied. The linear agglutination

method was used to study the disease in cattle, sheep and goats, and swine. Samples from mucous membranes, blood and meat and excrement were analyzed. The clinical course of the disease was like that of dysentery. Study of 252 workers at a meat packing plant showed that as many as 42.5% had antibodies of strain 09, while 39.7% had antibodies of strain 03 and 24.6% had antibodies of strain 05B. Similarly, 42.9% of the workers at a pork processing plant had 03 antibodies, while lesser incidence of other strains was noted. At a milk plant, 30.9% showed antibodies of 05 and 26%, those of strain 08. It is suggested that the likely method of human infection from sheep and swine was by contact, while for cattle it was also alimentary. The Y enterocolitica is considered to be an occupational disease. E.A.K.

N86-23231# Joint Publications Research Service, Arlington, Va.
TEST OF ERYTHROCYTE ANTIGEN DIAGNOSTIC AGENT FOR DETECTING ANTIBODIES TO COXIELLA BURNETTI Abstract Only
N. K. TOKAREVICH, S. SHRAMEK, and G. A. BAYAR *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 26 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 51-55
Avail: NTIS HC A06

The development of a diagnostic procedure and its testing on laboratory models, naturally infected humans and domestic animals is reported. Procedures include determination of the optimum sensitizing dose of lipopolysaccharides (LPS) and preparation of various test and control compounds, and analysis of the retarding effect of passive hemagglutination with a homologous antibody. Negative findings are reported for the serum of laboratory animals not infected with C. burnetti, and there are no false positive results with unsensitized LPS erthrocytes of sheep and data of passive hemagglutination reaction tests with the homologous pathogen. It is indicated that time of detection, titers and the duration of antibody circulation determined by various tests differ markedly. Combined use of complement fixation and passive hemagglutination tests increases the effectiveness of serological detection of Q-fever ricketsiosis, and helps n predicting the course of such infections. E.A.K.

N86-23232# Joint Publications Research Service, Arlington, Va.
DETECTION OF HBSAG IN FAMILIES OF CHILDREN WITH VIRAL HEPATITIS B Abstract Only
A. R. REYZIS, A. N. DRONDINA, A. A. ASRATYAN, M. Y. IVANOVA, and L. K. KOZHEVNIKOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 27 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 48-51
Avail: NTIS HC A06

The incidence of viral hepatitis (VHB) iin a families of children with confirmed cases of the disease is reported. Over a period of 3 years 142 mothers, 81 fathers and 7 relatives of 162 sick children were studied. Control groups included 39 members of 30 children with HBs-negative VH. Serum studies and countercurrent electrophoresis, precipitation and modifications, and passive hemagglutination reaction tests were conducted. The presence of HbsAg was confirmed in 6.9% of the relatives of children with clinically and laboratory confirmed VHB. A lesser number of medical parental involvement was found in HBsAg-positive parents, which suggested domestic infection of the children by chronic carriers of VHB to be a common phenomenon. Use of passive hemagglutination and countercurrent electrophoresis increased the frequency of detection by a factor of 2.4. E.A.K.

N86-23233# Joint Publications Research Service, Arlington, Va.
HBEAG AND ITS ANTIBODIES IN CARRIERS OF HSSAG IN VARIOUS REGIONS OF USSR Abstract Only
M. I. MIKHAYLOV, S. A. ARAKELOV, T. Y. VOROZHBIYEVA, S. V. ZHAVORONOK, S. V. ZUBOV, A. Y. KOZHUKHAR, G. N. KHORVAT, and V. A. ANANYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 27-28 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 71-74
Avail: NTIS HC A06

The surface antigen of hepatitus B (HBsAg), was studied in healthy carriers in regions showing various levels of incidence of the disease. Serum of 13,150 donors from the cities of Gorkiy, Vitebsk, Kishinev and Tashkent was studied by precipitation in gel and passive hemagglutination using a diagnostic approach. The HBeAg e-antigen and anti-HBe were determined and data indicate that regions with high incidence of HBsAg also have higher appearance of concentrations of the antigen which could be identified with gel precipitation procedures. The frequency of HBsAg appearance among carriers of the disease antigen is in direct relationship to the level of antigen incidence in a given region, while an inverse relationship is noted for HBeAg. While the level of HBsAg in Gorkiy, Kishinev and Tashkent is 1.4%, 5.0% and 9.0%, respectively, the corresponding figures for HBeAg are 5.5%, 12.3% and 13.3%. E.A.K.

N86-23234# Joint Publications Research Service, Arlington, Va.
SOME CHARACTERISTICS OF EPIZOOTIC PROCESS IN HEMORRHAGIC FEVER WITH RENAL SYNDROME Abstract Only
V. N. BASHKIRTSEV, Y. V. RYLTSEVA, Y. A. TKACHENKO, and A. G. STEPANENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-022) p 30 8 Jan. 1986 Transl. into ENGLISH from Voprosy Virusologii (Moscow, USSR), no. 4, Jul. - Aug. 1985 p 463-468
Avail: NTIS HC A06

Wild rodents caught on natural foci of hemorrhagic fever with renal syndrome (HFRS) in Ufa were analyzed for the presence of specific antigen of HFRS virus, for antibodies to this pathogenic agent and for native HFRS virus. A specific relationship was shown between the infection rate of bank voles with HFRS virus and the levels of circulating antigen and antibody to this virus. The immunity of test animals differed with age, older animals had higher immunity while, the younger animals showed more frequent presence of live virus. When selecting various age groups for isolation of viruses, the younger ones should be taken which have not manifested antibodies to the HFRS virus. E.A.K.

N86-23235# Joint Publications Research Service, Arlington, Va.
AIDS-FREE USSR MONITORING POTENTIAL OUTBREAK THERE Abstract Only
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 32 8 Jan. 1986 refs Transl. into ENGLISH from TRUD (Moscow, USSR), 6 Oct. 1985 p 4
Avail: NTIS HC A06

Clinical factors about the nature of the acquired immune deficiency syndrome (AIDS) and information on its incidence in the USA and on efforts of medical researchers to find a way of fighting it are reported. World health organization data about AIDS and its incidence around the world, and what is known about the virus are summarized. It is stated, that no cases AIDS have been recorded in the USSR. It is assumed that the problem is largely a social one, which is associated with sexual licentiousness, which is tolerated in certain circles in the West, but contrary to the nature of Soviet society. Soviet scientists are studying all aspects of the new diease. Taking part in the general struggle of the medical profession against this exceptionally serious ailment, the Soviet scientists are ready to cooperate with specialists from other countries. E.A.K.

N86-23236# Joint Publications Research Service, Arlington, Va.
ANTIBIOTIC PROPERTIES OF BIFIDOBACTERIA Abstract Only
M. B. SUNDUKOVA, V. F. SEMENIKHINA, V. I. GANINA, V. V. POSPELOVA, N. G. RAKHIMOVA, and M. P. KHALENEVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 33 8 Jan. 1986 Transl. into ENGLISH from Molochnaya Promyshlennost (Moscow, USSR), no. 8, Aug. 1985 p 36-38
Avail: NTIS HC A06

The spectrum of antibiotic activity of Bifidobacterium adolescentis MS-42, isolated from the GI-tract of a nursing infant was tested to determine the potential use of this bifidobacterium in the production of dairy products. Growth inhibition studies on Petri dishes showed that B. adolescentis MS-2 yielded inhibitation zones of 26 to 28 mm on streak plates with Shigella flexneri, Sh. sonnei. Straphylococcus aureus 209-p, Proteus vulgaris, and Proteus mirabilis. The antibiotic effects were confirmed with tube-dilution studies, which also encompassed Escherichia coli. In general, B. adolescentis was shown to exhibit greater antibiotic activity than B. bifidum, which is commonly used for enrichment of various darily products. Dietetic and therapeutic darily products were devsed which contain B. adolescentis MS-2. E.A.K.

N86-23238# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL VACCINES AND STIMULATION OF IMMUNITY
V. SAMOILOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 36-37 8 Jan. 1986 Repr. from Moscow News (Moscow, USSR), no. 33, 25 Aug. 1 Sep. 1985 p 10
Avail: NTIS HC A06

The creation of artificial vaccines and the possibility to produce an effective vaccine against any disease is discussed. Substances which could stimulate the organism's protective system, bypassing the gene patrol were examined. Such substances were found in some unsuitable polymeric molecules--polyelectrolytes. It is demonstrated that antigen-carrying polymer molecules include only those lymphocytes which can produce antibodies against the alien substance planted on the carrier. The new vaccines for preventing typhus in mice were tested. New vaccine injection into animals made it possible to save all of them from the disease. The dose of th eantigen was from 50 to 100 times less than in the usual vaccine. The virus has three main antigens two of them are proteins positioned on the surface of the virus particle, while the third is hidden int he membrane of the virus. The antigen planted on the polymeric molecule, ensures a strong generation of antibodies and protects the animals after they are infected with the virus.
E.A.K.

N86-23239# Joint Publications Research Service, Arlington, Va.
ARTIFICIAL ANTIGENS, VACCINES REVIEWED
V. V. POKROVSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 38-41 8 Jan. 1986 refs Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 106-111
Avail: NTIS HC A06

The chemical synthesis of molecular structures with the desired immunobiological characteristics of antigens to agents of infectious diseases in humans and animals is a new direction in constructing vaccine preparations and bacterial viral diagnostics. The artificial antigens which have a direct relationship to the agents of infectious diseases are examined. The artificial antigens the determinants are arranged in the form of offshoots from a polyacrylamide chain and these antigens possess the serological and immunoenic activity of he prototypes. The serological activity of the artificial antigen in a number of reactions is higher than the natural analog. The serological activity of artificial antigens was strictly group-specific. The unique properties of completely artificial antigens were used in creating highly specific diagnostic systems for immunoenzyme analysis. The artificial antigens activate specific immunity without using adjuvant and protective activity which keeps animals from becoming infected with virulent strains of salmonella. E.A.K.

N86-23240# Joint Publications Research Service, Arlington, Va.
OBTAINING HYBRIDOMAS THAT SYNTHESIZE MONOCLONAL ANTIBODIES TO POLYSACCHARIDE OF GROUP A STREPTOCOCCUS Abstract Only
Y. Y. PYTYEVA and E. I. DROBYSHEVSKAYA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 42 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 7, Jul. 1985 p 35-39
Avail: NTIS HC A06

Production of monoclone antibodies (MCA) for A-polysaccharides for A-polysaccharides (A-PS) using group A streptocuccus as the immune agent, and treating the resulting culture with pepsin is reported. Details of cell line identification, screening and storage of clones and production of ascites are summarized. Mice subsequently immunized with the compounds had the lowest titers for A-PS and for the vaccine with lower doses, and the highest with doses of 50 mcg/mouse. Analysis of experiments on determining optimum conditions for forming hybrids of spleen and myeloma cells mice. Screening was done with pepsin created vaccines of group A streptococcus and A-PS. It is shown that three of the monoclonal antibodies have ecipitation properties. Hybrid formation depends on the presence of immune splenocytes, rather than on ratios of myeloma cells and lymphocytes. The hight yield of hybrids came with growth of cells in 80 to 100% of alveoli. E.A.K.

N86-23241# Joint Publications Research Service, Arlington, Va.
FAB-FRAGMENT OF HETEROLOGIC IMMUNOGLOBULIN FOR FLU PROPHYLAXIS AND TREATMENT Abstract Only
V. I. DEGTYARENKO, V. F. ZEVAKOV, I. M. MAKSIMENKO, and V. A. DIVOCHA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-022) p 43 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1984 p 114-115
Avail: NTIS HC A06

Enzyme breakdown of heterologic immunoglobulin, particularly the bivalent Fab-fragment of antibodies, were studied for prophylactic and treatment effects. A Rivanol-alcohol method was used to separate the antiinfluenza immunoglobulin. After immunication, hyperimmune antiinfluenza serum was obtained from calves and subjected to enzyme hydrolysis. The effectiveness in neutralizing viruses was assessed. It is indicated that fundamentally new preparations should be studied for serum prophylaxis and serotherapy based on the Fab-fragment. E.A.K.

N86-23242# Joint Publications Research Service, Arlington, Va.
DESCRIPTION OF PREPARATION OF CAPSULAR ANTIGEN ISOLATED FROM YERSINIA PESTIS STRAIN EV Abstract Only
V. I. VEYNBLAT, M. M. TITENKO, M. S. VERENKOV, P. I. MENSHOV, A. V. KORMILITSYN, O. T. MOZHAROV, A. A. SHCHERBAKOV, A. S. VASENIN, and S. Y. ZADUMINA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 19-23
Avail: NTIS HC A06

The capsule antigen (FI) plays an important role in the virulence of Y. pestis and is a leading component of antiplague vaccine. The antigen obtained under mild conditions from hydrolysates of animal protein cultivated at 37C for 38 to 46 hours described. The bacterial mass was separated, distilled and dialysed to obtain test materials for passive hemagglutination. Amino acids, sugars, proteins, nucleic acids, polysaccharides and nitrogen were measured, along with the immunochemical activity of FI in comparison to other antiserums. It is indicated that the physicochemical and immunochemical homogeneity and activity of the preparation, along with viscosity, molecular weight, sedimentation and the isoelectric point, are distinct from those of previously known FIA and FIB capsule antigens. The capsule antigen is pure protein and not a glucoproteide. EAK

N86-23243# Joint Publications Research Service, Arlington, Va.
STUDY OF CELL-WALL ANTIGEN DETERMINANTS IN RIBOSOMAL PREPARATIONS OF GROUP A STREPTOCOCCUS Abstract Only
A. R. SHIKHMAN, L. V. NIKOLAYEV, O. A. KONDRAKOVA, B. B. DZANTIYEV, Y. I. BLINNIKOVA, N. F. DMITRIYEVA, Y. P. SAVELYEV, and G. I. PETROV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1936 Transl. into ENGLISH from Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Moscow, USSR), no. 4, Apr. 1985 p 15-19
Avail: NTIS HC A06

Ribosomal vaccines offer maximum immunity and minimum secondary reactions. Group A29, M-type, streptococcus ribosomes collected in of antibodies to M-protein, lipoteichoic acid and A-polysaccharides was studied. Double immunodiffusion by the Ouchterlony method were included that immunization of animals with ribosomes of group A29, M-type streptococcus caused development of antibodies to A-polysaccharides and lipoteichoic acid. E.A.K.

N86-23244# Joint Publications Research Service, Arlington, Va.
HYPOXIA PROPHYLAXIS AGAINST RADIATION INJURY
Y. SAMOILOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 48-50 8 Jan. 1986 Repr. from Moscow News (Moscow, USSR), no. 32, 18-25 Aug. 1985 p 10
Avail: NTIS HC A06

A method which enables patients to breathe mountainous air was developed. The method also reduces side effects resulting from radiotherapy treatment of malignant tumors. Method for the protection from ionizing radiation was developed. Air similar to that found at the mountain altitudes of 5.3 to 5.5 thousand meters above the sea level is pumped in through a face mask. Its oxygen content is twice as low as that of normal air on the plain. The effectiveness of oxygen-poor air is outlined. The reduction of oxygen content is considered to be a universal way to increase the adaptability potential of the organism, and its survivability under extreme conditions. E.A.K.

N86-23245# Joint Publications Research Service, Arlington, Va.
MANY MEDICAL USES FORESEEN FOR ARTIFICIAL SKIN
A. POMINOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences 8 Jan. 1986 Transl. into ENGLISH from Trud (Moscow, USSR), 25 Sep. 1985 p 4
Avail: NTIS HC A06

An artificial biological skin was developed. In 5 to 7 days the skin took, and no scars remained. Skin covering the burn was clear and normal, exhibiting only a color difference at first. The artificial skin is a mixture of two liquids a turbid yellow solution and a crystalline coligen, the main protein in connective tissue. The living water is used for burns, serious injuries, cuts, and scratches. E.A.K.

N86-23250# Joint Publications Research Service, Arlington, Va.
ASSESSMENT OF SELECTED PHYSIOLOGICAL INDICATORS IN ANTENNA OPERATORS AT SHORT-WAVE TRANSMITTING AND RECEIVING CENTERS
L. V. POKHODZEY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 67-68 8 Jan. 1986 Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 7, Jul. 1985 p 36-39
Avail: NTIS HC A06

The effects of electromagnetic emission on personnel servicing antenna feeder systems at short-wave transmitting and receiving stations were assessed. The workers in question were employed at low intermediate, and high wattage stations. No general or long-lasting effects were found on psychological and most physiological parameters, with the different levels of exposure generating a pattern of similar changes which differed somewhat in intensity. Deviations from normal noted, however subsided by the intensity. Deviations from normal noted, however subsided by the end of a working day. The visual analyzer noted functional lability at the end of a day, particularly in workers exposed to the higher intensity fields. Moderate hypotension persisted in workers exposed to moderate and high intensity fields. In all groups hand strength diminished by 18.6 to 25.4% at the end of a working week while the level of reduction in a control--unexposed--group was 10%. Determination of safe levels of electromagnetic exposure requires djustment of radiation intensity. E.A.K.

N86-23251# Joint Publications Research Service, Arlington, Va.
STATUS OF CALCIUM METABOLISM IN COAL MINERS WITH VIBRATION SICKNESS Abstract Only
V. V. KOLOMIYETS *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 75-76 8 Jan. 1986 Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 9, Sep. 1985 p 13-16
Avail: NTIS HC A06

The status of calcium metabolism in coal miners with various degree of vibration sickness was with data from 32 healthy control males. Total and ionized serum calcium levels were significantly elevated in 94 coal miners with vibration sickness, the degree of elevation show a direct correlation with the clinical severity of the illness. The data show that renal calcium clearance and the calcium binding capacity of the serum in the patient group is diminished in comparison with the control subjects. Urine calcium levels did not show any statistical differences between these two gropus. It is indicated that vibration sickness is accompanied by a profound alteration in calcium homestasis, due in large to enhanced calcium resorption in the kidneys. E.A.K.

N86-23256# Joint Publications Research Service, Arlington, Va.
VACCINE PROTEINS R AND D ON SALYUT-7 Abstract Only
T. CHESANOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 107 8 Jan. 1986 Transl. into ENGLISH from Leningradskaya Pravda (Leningrad, USSR), 13 Oct. 1985 p 2
Avail: NTIS HC A06

Experiments performed on Salyut orbiting stations were aimed, at obtaining extrapure hemagglutinin and other surfae proteins of the influenza virus, using the electrophoresis method. The space experiments demonstrated that such products can be obtained in conditions of zero gravity. A new-generation electrophoretic unit the EFU-Robot is used on the Salyut-7 station. The EFU-Robot can be programmed to select samples of substances purified in the course of experiments and automatically transfer the samples from the unit's working chamber to ampules, by syringes. E.A.K.

N86-23259# Joint Publications Research Service, Arlington, Va.
ESTIMATE OF EMOTIONAL STRESS DURING WORKING ACTIVITY BASED ON SYSTEMS ANALYSIS OF SKIN-GALVANIC REACTION Abstract Only
G. K. RAKOV and Y. A. FADEYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 101 12 Mar. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 3, May - Jun. 1985 p 463-469
Avail: NTIS HC A07/MF A01

Emotional factors of labor and the nature of their relationship to emotional reactions of female electronics-industry workers during assembly and subsequent testing of the electronic-optical system of color kinescopes. Twenty healthy female workers 18 to 40 years of age were determined were studied during assembly of electronic equipment. Significant differences were found between three working stages: (1) pressing in of subassemblies; (2) testing of the capacitance of electron guns; and (3) attachment of cathods holders. It was found that the skin-galvanic reaction is an adequate indicator of emotional stress during working activity. Systems analysis of operations or pressing in assemblies in correlation with development of skin-galvanic responses revealed emotiogenic stages of activity. E.A.K.

N86-23260# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF COMPLEXITY OF CONTROL TASK ON LEVEL OF ACTIVATION OF OPERATORS PHYSIOLOGICAL FUNCTIONS WHEN WORKING WITH WAITING Abstract Only
M. A. GRITSEVSKIY and Z. I. ZAYTSEVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 102 12 Mar. 1986 Transl. into ENGLISH from Fiziologiya Cheloveka (Moscow, USSR), v. 11, no. 3, May - Jun. 1985 p 504-510
Avail: NTIS HC A07/MF A01

Experiments were conducted to answer two questions: (1) do model experiments reveal differences in the functional status in comparing operator's work with various degrees of complexity; and (2) are these changes similar in nature to those manifestations of differing intensity discovered under production conditions. Programs with various specific shares of single and multiple movement control tasks were used to model operators work of varying degrees of complexity. During the experiments, reaction time, EEG, skin-galanic reaction and pulse rate were continually recorded. Differences in bioenergetic activity of the cerebral cortex and differences in autonomic activity and regulations were observed. It is indicated that waiting for signals requiring complex processing is accompanied by higher mobilization of preparedness of the operator. Decreased attention level was observed at the beginning of the day and toward the end of long days. E.A.K.

N86-23263# Joint Publications Research Service, Arlington, Va.
METHOD OF CHANGES IN REVERSIBLE PATTERN MASKING AS FACTOR IN VISUAL PERCEPTION Abstract Only
V. M. KROL and Y. I. BONDAR *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 122 12 Mar. 1986 Transl. into ENGLISH from Voprosy Psikhologii (Moscow, USSR), no. 3, May - Jun. 1985 p 162-164
Avail: NTIS HC A07/MFen1] A01

Temporal characteristics of form perception were analyzed in relation to masking patterns. It is demonstrated that different masks exert different effects on various stages of perception. Three stages were identified in form perception using stimuli consisting of alternating bands and lines arranged in horizontal patterns, and masking patterns consisting either of random curviiinear lines alone or supplemented with solid, short, bands. The different masking patterns exerted different effects (prolongation) on the threshold times for amorphous perception, approximate classification of test pattern, and on object identification. It is demonstrated that different masking patterns significantly affect different stages of form perception, and can be utilized in the analysis of the latter. E.A.K.

N86-23265* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CUMULATIVE INDEX TO THE 1985 ISSUES
Jan. 1986 291 p
(NASA-SP-7011(280); NAS 1.21:70011(280)) Avail: NTIS HC A13 CSCL 06E

This publication is a cumulative index to the abstracts contained in the Supplements 268 through 279 of Aerospace Medicine and Biology: A Continuing Bibliography. It includes seven indexes - subject, personal author, corporate source, foreign technology, contract number, report number, and accession number. Author

N86-23266 California Univ., Berkeley.
HUMAN HEAD/NECK/UPPER-TORSO MODEL RESPONSE TO DYNAMIC LOADING Ph.D. Thesis
Y. C. DENG 1985 282 p
Avail: Univ. Microfilms Order No. DA8524027

A human head/neck/upper-torso replica was constructed and instrumented to study its reponse to impact and dynamic loading. The model consists of a water-filled cadaver skull; plastic vertebrae, sternum and ribs; silicon rubber disks and ligaments: and fabric muscles. The static behavior of the system under sagittal plane and lateral loading was adjusted so as to correspond to that of cadaver behavior under similar loading. The tests conducted involved impulsive loading to the torso generated by means of a sled and track system and by direct head impact with a suspended steel ball. A three-dimensional lumped-parameter model of the human head/neck/upper-torso was developed in order to predict its motion for any specified initial conditions that could also be used to compare with other investigators' results. The simulation results indicate favorable comparison with the human volunteer test data for both flexion and lateral whiplash. However, the physical structure appeared to be more flexible than the numerical model. Dissert. Abstr.

N86-23267 National Physical Lab., Teddington (England). Div. of Radiation Science and Acoustics.
A SURVEY OF SPEECH AUDIOMETRY IN THE NATIONAL HEALTH SERVICE
H. C. FULLER and I. K. MOSS Aug. 1985 52 p refs
(NPL-AC-105; ISSN-0143-7143) Avail: Issuing Activity

Nine clinics in the UK National Health Service (NHS) were visited to discuss with the audiologists the technique of speech audiometry and to observe how the tests were conducted. The information gained was used to construct a questionnaire which was then circulated to NHS hearing aid clinics throughout the UK. Topics covered included the frequency of use of speech audiometry, word lists, recordings, equipment and test procedures, criticisms of test material, and limitations on the use of speech audiometry. Author (ESA)

N86-23268# British Aerospace Aircraft Group, Bristol (England). Human Factors Dept.
THE BAE D TARGET ACQUISITION MODEL ORACLE: AN OVERVIEW, 1984
J. L. HINTON Feb. 1984 30 p refs
(BAE-JS-10009; BR94986) Avail: Issuing Activity

The concepts used in the ORACLE model of human visual performance, and in system models that may be used with it are outlined. The state of the model is described, including the modeling of human visual performance and treatment of visual aids. Model uses are summarized. Author (ESA)

N86-23269# Sloan-Kettering Inst. for Cancer Research, New York.
BIOMEDICAL RESEARCH WITH CYCLOTRON PRODUCED RADIONUCLIDES Progress Report, 1 Aug. 1984 - 31 Jul. 1985
J. S. LAUGHLIN 31 Aug. 1985 62 p refs
(Contract DE-AC02-77EV-04268)
(DE86-000327; DOE/EV-04268/T4) Avail: NTIS HC A04/MF A01

Nine interrelated studies are reported on experimental and clinical uses of nitrogen-13 or carbon-11. Chemical and enzymatical methods are provided for the production of labelled amino acids. Comparative distribution studies of N-13 ammonia, glutamine, (ALPHA)-aminobutyric acid, methionine, valine, leucine, and glutamate after retro-orbital injection have been completed. The data show most of the label (% dose/organ) going to liver and muscle regardless of the injected agent. DOE

N86-23270# Oak Ridge National Lab., Tenn.
RADIATION INDUCTION OF CANCER OF THE SKIN
R. J. M. FRY, J. B. STORER, and F. J. BURNS 1985 13 p refs Presented at the Workshop on Radiation Damage To Skin: Fundamental and Practical Aspects, Paris, France, 9 Oct. 1985 Prepared in cooperation with New York Univ., N.Y.
(Contract DE-AC05-84OR-21400)
(DE86-002201; CONF-851065-1) Avail: NTIS HC A02/MF A01

The induction of epidermal tumors was studied using exposures to 25 kV X-rays with or without subsequent exposures to 12-0-tetradeconyl phorbol-13 acetate (TPA) or ultraviolet radiation (UVR) 280 to 400 nm. Fractionation regimens and total exposure up to 4000R produced no squamous cell carcinomas. When these regimes were followed by TPA an incidence of about 80% was obtained, and incidence of 60% when UVR exposures followed the x-irradiation. A dose-dependent increase in fibrosarcomas was

found when x-irradiation was followed by 24 weeks of topical treatment with TPA. These results support the contention that UVR can enhance the expression of cells initiated by X-rays. The experimental evidence is compared with the data from the tinea capitis patients treated with X-rays. In C3HF/He male mice exposed to 50, 100, 150 and 200 rads (137)Cs gamma rays the induction rate for fibrosarcomas was 2.9 x 10(-4) per cGy/per mouse. This result compares with 2.5 x 10(-6) transformations per surviving cell per cGy with 10T1/2 cells that are fibroblasts derived from C3H mice. DOE

N86-23271# Oak Ridge National Lab., Tenn.
PRODUCTION AND CHARACTERIZATION OF ANTIBODIES TO BENZO(A)PYRENE
G. D. GRIFFIN, K. R. AMBROSE, R. N. THOMASON, C. M. MURCHISON, M. MCMANIS, P. G. R. ST.WECKER, and T. VO-DINH 1985 13 p refs Presented at the 10th International Symposium on Polynuclear Aromatic Hydrocarbons, Columbus, Ohio, 21 Oct. 1985 Prepared in cooperation with Tennessee Univ., Knoxville, Tenn.
(Contract DE-AC05-84OR-21400)
(DE86-002204; CONF-851068-3) Avail: NTIS HC A02/MF A01

This report describes the preparation of antibodies to benzopyrene labelled bovine serum albumin. DOE

N86-23272# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
MEASUREMENT TECHNIQUES FOR USE WITH TECHNIQUE/EXPOSURE GUIDES Final Report
E. F. MANNY and R. L. BURKHARDT Aug. 1985 30 p
(PB86-123718; HHS/PUB/FDA-85-8248; FDA/CDRH-86/7)
Avail: NTIS HC A03/MF A01 CSCL 06E

The Center for devices and Radiological Health recommends that diagnostic radiology facilities evaluate the radiation exposure received by their patients. The technical factors which must be considered in instituting a radiation exposure measurement program as a basis for this evaluation are discussed. Center radiation exposure measurement methods are described. GRA

N86-23273# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
EVALUATION OF RADIATION EXPOSURE FROM DIAGNOSTIC RADIOLOGY EXAMINATIONS: GENERAL RECOMMENDATIONS Final Report
Aug. 1985 10 p refs
(PB86-125903; HHS/PUB/FDA-85-8246; FDA/CDRH-86/5)
Avail: NTIS HC A02/MF A01 CSCL 06E

Optimization of the medical radiation the public receives by minimizing unnecessary radiation exposure and improving the diagnostic benefit from the necessary exposure is discussed. Steps toward this goal include a performance standard for the manufacture and installation of X-ray equipment, quality assurance guidance for the maintenance of the equipment, training in the proper use of the equipment, and selection criteria for X-ray examinations. Recommendations are listed that introduce an additional basic step. GRA

N86-23274# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
EVALUATION OF RADIATION EXPOSURE FROM DIAGNOSTIC RADIOLOGY EXAMINATIONS: TECHNIQUE/EXPOSURE GUIDES FOR THE CRANIOCAUDAL PROJECTION IN MAMMOGRAPHY Final Report
Aug. 1985 10 p refs
(PB86-126075; DHHS/PUB/FDA-85-8244; FDA/CDRH-86/4)
Avail: NTIS HC A02/MF A01 CSCL 06E

Suggestions for appropriate Technique/Exposure guides for use with the mammographic craniocaudal projection are presented. This type of projection is the most commonly used mammographic view and much exposure data is available for it. Problems affecting radiation exposure and image quality with one projection often are problems affecting all projections conducted with a particular X-ray imaging systems. The use of T/E guides to detect and correct the problems with the craniocaudal projection will have a beneficial effect on exposure levels and image quality of other projections conducted on the same system. GRA

N86-23275# Food and Drug Administration, Rockville, Md. Center for Devices and Radiological Health.
BEHAVIORAL EFFECTS OF MICROWAVE RADIATION ABSORPTION Final Report
J. C. MONAHAN and J. A. DANDREA Aug. 1985 173 p refs Prepared in cooperation with Utah Univ., Salt Lake City
(PB86-113735; HHS/PUB/FDA-85-8238; FDA/CDRH-85/72)
Avail: NTIS HC A08/MF A01 CSCL 06R

The need for an understanding of the biological effects induced by exposure to microwave radiation has increased in recent years because of increased usage and applications and also concerns about potential adverse health effects. Although many research studies have been conducted to examine the question of biological effects, the information is scattered in many diverse sources. This publication brings together in a single source the major research findings related to the behavioral consequences of microwave exposure. In addition it attempts to provide a critical assessment of this information and to provide a perspective upon which the reader can interpret the findings. This publication begins with a review of behavioral-microwave research in the Soviet Union and then proceeds to examine the work of researchers in the Western countries. Both learned and unlearned behaviors are examined in the context of microwave induced effects. GRA

N86-23276# Health Effects Research Lab., Research Triangle Park, N. C.
SYSTEM FOR MEASUREMENT OF SMALL VIBRATIONS AT MATERIAL INTERFACES INDUCED BY ELECTROSTRICTIVE FORCES
J. S. ALI and W. T. JOINES Oct. 1985 157 p refs
(PB86-116530; EPA-600/1-85-021) Avail: NTIS HC A08/MF A01 CSCL 06B

The mechanisms of interaction of ELF and ELF-modulated RF fields with biological systems is presently an active area of research. Some models propose that field-induced forces may influence certain observed biological effects such as RF hearing and calcium ion efflux. To investigate the validity of the field-induced force model for the calcium-ion efflux effect, a system is needed which is capable of exposing samples to ELF fields or to ELF-modulated RF fields. At the same time the induced vibration caused by the forces of electrostriction must be monitored preferably by a non-contacting method. A microwave phase-sensitive receiver was designed to sense the small vibrations. Limitations on the receiver sensitivity imposed by phase noise is discussed. Phase noise measurement systems were designed and used to charactrize the key receiver components. A limiting amplifier in the IF section of the receiver eliminates the need for knowledge of the reflection coefficient of the object of interest for quantitative vibration measurements. GRA

N86-23277# Johns Hopkins Univ., Laurel, Md. Applied Physics Lab.
HUMAN REACTIONS TO TRANSIENT ELECTRIC CURRENTS Final Report
J. P. REILLY and W. D. LARKIN Jun. 1985 172 p Sponsored in part by the Maryland Dept. of Natural Resources, Annapolis and the Canadian Electrical Association, Montreal, Quebec
(PB86-117280; PPSP/JHU/PPSE-T-34) Avail: NTIS HC A08/MF A01 CSCL 06P

Research carried out at the Johns Hopkins University Applied Physics Laboratory on aspects of human sensitivity to transient electrical stimulation is described. High-voltage short-duration currents of the kinds that may be encountered near power substations, transmission lines, or industrial apparatus are emphasized. Human sensitivity is measured for a variety of stimulating conditions, both at the threshold of perception and above it, up to the tolerance limit. A neural excitation model is invoked to account for a wide array of sensory effects, and to serve as a framework for predicting effects not studied. Among

the factors studied are: voltage, capacitance; polarity, waveshape, and duration of the stimulating waveforms; ac versus dc stimulating; electrode approach velocity and contact force;l skin temperature; skin resistance; skin hydration; electrode contact area; and stimulated body location. GRA

N86-24192* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 283)
Apr. 1986 69 p
(NASA-SP-7011(283); NAS 1.21:7011(283)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 184 reports, articles, and other documents introduced into the NASA scientific and technical information system in March 1986. Author

N86-24193 Institut fuer Flugmechanik, Brunswick (West Germany).
THE EFFECT OF HIGH FREQUENCY ELECTROMAGNETIC FIELDS ON HUMAN BEINGS (FREQUENCY RANGE BETWEEN 1 KHZ AND 1000 GHZ) [DIE WIRKUNG HOCHFREQUENTER ELEKTROMAGNETISCHER FELDER AUF DEN MENSCHEN (1KHZ UND 1000 GHZ)]
A. H. FRUCHT (Deutschen Zentralinstituts fuer Arbeitsmedizin, Berlin-Lichtenberg, West Germany), N. KRAUSE, G. NIMTZ (Technische Univ., Berlin), and H. SCHAEFER 1984 128 p refs In GERMAN
Avail: Issuing Activity

The biological effects of high frequency electromagnetic fields were investigated to provide information for industrial safety personnel. The high frequency radiation problem is described. Medicinal and technical applications of high frequency electromagnetic fields are presented. The interactions between high frequency electromagnetic waves and matter are explained. Health problems due to these fields are depicted. Diathermy as a source of danger is discussed. A case of death after extreme exposure to radar radiation is given. Tasks and possibilities for epidemiological research are presented. It is concluded that health damage due to high frequency electromagnetic fields do not occur as long as the known power thresholds are not exceeded. Author (ESA)

N86-24194# Ohio State Univ., Columbus.
OPTICAL AND EVENT-DURATION VARIABLES AFFECTING SELF-MOTION PERCEPTION Interim Paper Jan. 1984 - Apr. 1985
D. H. OWEN Nov. 1985 198 p
(Contract F33615-83-K-0038)
(AD-A161836; AFHRL-TP-85-23) Avail: NTIS HC A09/MF A01 CSCL 01D

Four experiment sections are included in this paper. The first pair of experiments investigated the usefulness of optical flow acceleration in detecting descent. When sink rate and ground speed are constant, optical flow accelerates. Holding fractional loss in altitude constant throughout a descent ovent also holds flow rate invariant, eliminating flow acceleration as a potential source of information. Detection of descent was accomplished easily without flow acceleration, and it was found that at least one of the remaining functional optical variables specifying fractional loss in altitude must be highly salient. Also, the effect of optical texture density was optimal when linkages with other relevant variables were taken into account. The third experiment compared eyeheight and ground-unit size as metrics for global optical information specifying descent. Given that flow acceleration is not an essential source of information, the study focused on eyeheight-scaled change in optical display and ground-unit-scaled change in optical density as functional specifiers of fractional loss in altitude. The fourth experiment investigated the interation between global optical flow rate and duration of a constant-speed preview period. Of particular interest was the possibility that preview periods of different durations would differentially favor or interfere with sensitivity given particular optical conditions, e.g., different flow rates. GRA

N86-24195# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
THE ENERGY COST OF COMBAT ENGINEER TASKS
W. S. MYLES and T. T. ROMET Aug. 1985 20 p
(AD-A161861; DCIEM-85-R-31) Avail: NTIS HC A02/MF A01 CSCL 06S

Canadian combat engineers performed abatis (blocking a road by falling trees), minelaying and road cratering for 8 hours each day on four consecutive days. Energy expenditure was estimated from heart rate continuously recorded using the VITALOG personal monitoring system (PMS-8). The average heart rates were below 120 bpm for all three combat engineer tasks indicating that, for these subjects, energy expenditure did not exceed 35 to 40% of their VO2max. Since abatis, minelaying and cratering are considered to be the most physically demanding tasks performed by combat engineers, it seems safe to conclude that the average energy expenditure for sustained operations will be at, or below, this level. This experiment also provided an opportunity to evaluate the PMS-8 as a means of collecting physiological data in a nonintrusive manner during military maneuvers. The system proved to be very robust, reliable and, because data collection is continuous, ideal for intermittent work of varying intensity. In addition, the PMS-8 appears to have considerable potential as a means of monitoring the effect of sleep deprivation and fatigue on the work/recovery cycle in sustained operations. Author (GRA)

N86-24196# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
DRUGS OF ABUSE IN AVIATION FATALITIES. 1: MARIJUANA
D. J. LACEFIELD, P. A. ROBERTS, and P. M. GRAPE Aug. 1985 6 p
(AD-A161911; DOT/FAA/AM-85/8) Avail: NTIS HC A02/MF A01 CSCL 06O

Isopropyl alcohol swabs taken from the oral cavities of pilots killed in general aviation accidents were analyzed for marijuana by the modified Duquenois-Levine test. During the 2-year period from October 1982 through September 1984, 289 pilot fatalities (of 809 sampled for other toxicological reasons) were sampled for marijuana; a positive test indicated the recent use of marijuana. Six of the pilots' samples (2.1%) were positive. GRA

N86-24197# Army Research Inst. of Environmental Medicine, Natick, Mass.
ENVIRONMENTAL STRESS AFTER ATROPINE TREATMENT
M. A. KOLKA, L. A. STEPHENSON, and R. R. GONZALEZ Oct. 1985 23 p
(Contract DA PROJ. 3M2-63764-D-995)
(AD-A161923) Avail: NTIS HC A02/MF A01 CSCL 06O

Atropine administration resulted in higher skin temperatures in both sensible and insensible environments and a higher core temperature in the hot environment, due to the reduction in whole body sweating. The effect of heat storage (significantly higher after atropine) was shown to be greater in the hot environment due to inadequate sweat secretion for subsequent evaporative cooling. In the warm environment, enhanced skin blood flow resulted in more effective thermoregulation. The results suggest that exercise in the heat can be accomplished during environmental stress at warm temperatures after atropine treatment. Author (GRA)

N86-24198# Army Research Inst. of Environmental Medicine, Natick, Mass.
RESPIRATORY RESPONSE AND MUSCLE FUNCTION DURING ISOMETRIC HANDGRIP EXERCISE AT HIGH ALTITUDE
R. L. BURSE, A. CYMERMAN, and A. J. YOUNG 15 Jul. 1985 33 p
(AD-A162003; USARIEM-M-2/86) Avail: NTIS HC A03/MF A01 CSCL 06S

The purpose of this investigation was to determine if the hyperventilatory response to fatiguing isometric exercise at sea level could predict resting ventiliation and acute mountain sickness

(AMS) at 4300 m altitude. Exercise consisted of four successive endurance handgrips held to complete fatigue at 40% of maximum isometric handgrip strength (MHS). There was no relationship between the magnitude or pattern of exercise-induced hyperventiliation at sea level and the severity of AMS later at altitude. Sea level hyperventilatory response was not predictive of resting ventilation at altitude. Altitude exposure progressively increased both the incidence and magnitude of the hyperventilatory response to exercise and prolonged it for 60 to 90 s into the recovery period, providing support for the central command theory of ventilatory control during isometric exercise. MHS was significantly increased at altitude, by 11% on day 2 and 16% on day 6. Endurance times to fatigue were reduced, but not always significantly so. GRA

N86-24199# Illinois Univ., Chicago. Chicago Circle Dept. of Bioengineering.

REMOTE SENSING OF BODY SIGNS AND SIGNATURES Final Report, 1 Aug. 1982 - 30 Sep. 1985

J. C. LIN and K. H. CHAN Oct. 1985 82 p

(Contract N00014-82-C-0659)

(AD-A162106; BES-5) Avail: NTIS HC A05/MF A01 CSCL 17I

This report describes the development of a microprocessor-based remote sensing system for noncontact detection of heart rate and respiration. Low power sinusoidal microwave signal at a frequency of 10.525 GHz is generated by a Gunn diode oscillator in an integrated Doppler transceiver. A standard gain horn is used to direct the microwave energy to the chest of a subject at a distance of a few centimeters. Since movements associated with the contraction of the heart and expansion of the lungs are translated into motions of the chest wall, the Doppler microwave reflected from the chest is processed to yield information on the frequency and regularity of these cardiopulmonary events. The microprocessor-based battery-powered system is designed to provide continuous operation for approximately one hour. It allows selection of heart rate or respiration to be displayed on a 3-digit LCD. An analog output jack is provided for oscilloscope display or chart recording. The design range of heart rates is from 40 to 200 beats per minute and that for respiration is from 3 to 30 breaths per minute. The signal acquisition times for heart rate and respiration determinations are 12 and 48 seconds. respectively. GRA

N86-24200# Illinois Univ., Urbana-Champaign. Inst. of Aviation.

ANTIEMETIC DRUGS AND PILOT PERFORMANCE Interim Report, Feb. 1983 - Feb. 1984

H. L. TAYLOR, J. A. DELLINGER, M. H. WELLER, B. C. RICHARDSON, and F. C. HYMAN Nov. 1985 44 p Prepared in cooperation with Michigan Univ., Ann Arbor

(Contract F33615-83-K-0612)

(AD-A162109; USAFSAM-TR-84-52) Avail: NTIS HC A03/MF A01 CSCL 06O

This study evaluated the effects on human performance of three antiemetic drugs. The effects on pilot performance in a flight simulator were determined using the commonly prescribed dosages, standardized for a 70 kg person, of thiethylperazine (10 mg), promethazine hydrochloride (25 mg) cimetidine (300 mg), and a placebo control. Two tasks, a two-dimensional tracking task which part of an instrument landing system (ILS) approach and the Sternberg choice reaction time task, were used to generate pilot performance data. A Latin square design was used to balance treatment order effects, and each subject received each treatment condition. Log root mean square (RMS) deviation values, computed from the simulator flight data (altitude straight and level, altitude turning, localizer (lateral) tracking, glideslope (vertical tracking) were used in a multivariate analysis of variance to test the main effects. An approximate F-test, based on Wilk's criterion, resulted in $F(12,87) = 2.47$, ($P0.0008$) for the treatment main effect (drug). Univariate analyses resulted in a significant drug main effect on two primary task variables–altitude straight and level and localizer tracking. Contrasts between the three antiemetic drugs and the placebo were used to test the hypothesis of no significant difference between treatment pairs. The contrasts between promethazine hydrochloride and the control were significant for altitude straight and level and for glideslope tracking. The other contrasts were not significant except for the control-thiethylperazine contrast for the localizer tracking variable. GRA

N86-24201# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.

CHARACTERISTICS OF MEDICALLY DISQUALIFIED AIRMAN APPLICANTS IN CALENDAR YEARS 1982 AND 1983

S. J. DARK Sep. 1985 23 p

(AD-A162209; DOT/FAA/AM-85/9) Avail: NTIS HC A02/MF A01 CSCL 06E

This study presents comprehensive data reflecting pertinent denial rates with respect to the medical and general attributes of those airmen denied medical certification in calendar years 1982 and 1983. The study updates previously reported data with respect to medical certification denials. The denial data were obtained from computer files as of July 1, 1983, for calendar year (CY) 1982 applicants and July 1, 1984, for CY 1983 applicants. The data were summed for the 2 calendar years to provide a larger group for comparison with the December 31, 1982, active airman population, the midpoint population date for the denied applicant group. The annual denial rate based on the airman applicants is 6.2 per 1,000 airmen. By class of certificate applied for, the annual denial rate per 1,000 applicants is 3.3 for first class, 3.8 for second class, and 8.6 for third class. As anticipated, general aviation and new applicants contribute greatly to total denials. The most significant causes for denial (regardless of class applied for) are cardiovascular, the miscellaneous pathology category (endocrinopathies, disqualifying medications, and administrative denials), neuropsychiatric, and at a substantially lower level, eye pathology. The updated data on medically disqualified applicants are consistent with expectations and previous findings, with cardiovascular diseases still the number one cause for denial. GRA

N86-24202# Army Research Inst. of Environmental Medicine, Natick, Mass.

EFFECTS OF WEARING NBC (NUCLEAR, BIOLOGICAL AND CHEMICAL) PROTECTIVE CLOTHING IN THE HEAT ON DETECTION OF VISUAL SIGNALS

J. L. KOBRICK and L. A. SLEEPER Feb. 1985 26 p

(Contract DA PROJ. 3M1-61102-BS-10)

(AD-A162321; USARIEM-T7/85) Avail: NTIS HC A03/MF A01 CSCL 06P

Sensitivity for detection of visual signals distributed at various locations throughout the visual field was studied in 16 male subjects during degrees of ambient heat exposure (91F/61%RH; 70F/35%RH; 55F/35%RH), in combination with and without wearing of the Army NBC protective clothing system (MOPP-IV). Response time for signal detection increased systematically and significantly with peripheralization of stimulus locations, was most impaired in the superior and inferior visual field areas, and least affected along the horizontal axis area. The data support previous results obtained using this task. Both the heat and the heat+MOPP-IV exposure conditions produced highly significant systematic increases in response time to all signals; the worst performance occurred under the heat+MOPP-IV combination. Implications for visual performance while wearing chemical protective gear are discussed. GRA

N86-24203# Army Research Inst. of Environmental Medicine, Natick, Mass.

AN EVALUATION OF TESTS OF ANAEROBIC POWER

J. F. PATTON and A. DUGGAN Dec. 1985 22 p

(AD-A162826; USARIEM-M7/86) Avail: NTIS HC A02/MF A01 CSCL 06P

The objectives of this study were to examine the relationship between two laboratory tests of anaerobic power (AnP) and to compare these tests to field measures of AnP. Fifteen Soldiers, aged 20 to 34 yrs, performed: (1) a 30S maximal cycle ergometer test (Wingate test, WT); (2) a 60S isokinetic knee extension test (isokinetic endurance test, IET); (3) a 50m spring; (4) a 200m

sprint; and (5) the Margaria stairclimb test. Significant correlations ranging from 0.52 to 0.76 were found between the WT and IET for peak and mean values of power and torque, respectively. Indices from both these tests also correlated significantly with the field tests of AnP. The best single index was mean power from the WT which had correlations of -0.79, -0.82, and 0.74 with the 50m and 200m sprint times and the Margaria test, respectively. The data suggest that both the WT and IET represent valid laboratory tests for evaluating high-intensity short-term exercise in which the muscle is primarily dependent upon anaerobic processes for energy release. Author (GRA)

N86-24204# IIT Research Inst., Chicago, Ill.
EXTREMELY LOW FREQUENCY (ELF) COMMUNICATIONS SYSTEM BIO-EFFECTS LIBRARY DEVELOPMENT Final Technical Report, Mar. - Oct. 1985
M. M. ABROMAVAGE, J. J. ENGLISH, L. M. KUDIA, and M. S. MACINTYRE Oct. 1985 255 p
(Contract N00039-84-C-0070)
(AD-A162839; IITRI-E06549-21) Avail: NTIS HC A12/MF A01 CSCL 06C

The professional literature published and available since August 1984 on the biological, ecological and health effects from exposure to Extremely Low Frequency (ELF) electromagnetic fields is compiled alphabetically by principal author. Each of the 485 citations is categorized according to electromagnetic field characteristics. Key biological and engineering terms are provided, and species of interest are identified. Author (GRA)

N86-24205# IIT Research Inst., Chicago, Ill.
ELF (EXTREMELY LOW FREQUENCY) BIOLOGICAL EFFECTS LITERATURE DATA BASE MANAGEMENT SYSTEM Final Report
J. J. ENGLISH and L. M. KUDIA Oct. 1985 44 p
(Contract N00039-84-C-0070)
(AD-A162900; IITRI-E06549-20) Avail: NTIS HC A03/MF A01 CSCL 09B

Described are the functions and operation of the ELF biological effects literature data base management system. It covers functional requirements, system implementation, data base description, system operations, and detailed procedures. The system utilizes an IBM PC/XT computer and dBASE-III software. GRA

N86-24206# Naval Health Research Center, San Diego, Calif.
CHANGES IN FITNESS AND SHIPBOARD TASK PERFORMANCE FOLLOWING CIRCUIT WEIGHT TRAINING PROGRAMS FEATURING CONTINUOUS OR INTERVAL RUNNING Final Report
E. J. MARCINIK, J. A. HODGDON, C. E. ENGLUND, and J. J. OBRIEN Aug. 1985 18 p
(AD-A163110; NAVHLTHRSCHC-85-33) Avail: NTIS HC A02/MF A01 CSCL 05I

This investigation compared physical fitness and work performance changes following participation in circuit weight training regimes featuring either interval or continuous running programs. Results indicated that participation in the circuit weight training/run regimes was associated with differential changes in fitness but not shipboard work performance. Furthermore, the association between training induced fitness gains and relative improvement in job performance appeared to be specific to the task modelled. Important predictors of criterion job performance included measures of both upper and lower torso muscular strength. Regression analyses yielded the following prediction equation: Composite shipboard performance(s) = 194.15097-1.59492 (arm curl)-, 18369 (leg press) r=0.74. GRA

N86-24207# Naval Health Research Center, San Diego, Calif.
L-TRYPTOPHAN ADMINISTERED TO CHRONIC SLEEP-ONSET INSOMIACS: LATE-APPEARING REDUCTION OF SLEEP LATENCY Final Report, Dec. 1980 - Nov. 1985
C. L. SPINWEBER 1 Nov. 1985 19 p
(AD-A163115; NAVHLTHRSCHC-85-42) Avail: NTIS HC A02/MF A01 CSCL 06P

The effects of 3 g 1-tryptophan on sleep, performance, arousal threshold, and brain electrical activity during sleep were assessed in 20 male, chronic sleep-onset insomniacs (mean age 20.3 + or - 2.4 years). Following a sleep laboratory screening night, all subjects received placebo for 3 consecutive nights (single-blind), 10 subjects received 1-tryptophan and 10 subjects received placebo on 2 withdrawal nights (single-blind). There was no effect of 1-tryptophan on sleep latency during the first 3 nights of administration. On the 4th-6th nights of administration, sleep latency was significantly reduced. Unlike benzodiazepine hypnotics, 1-tryptophan did not alter sleep stages, impair performance, elevate arousal threshold, or alter brain electrical activity during sleep. GRA

N86-24208# Harvard Univ., Cambridge, Mass. Energy and Environmental Policy Center.
ANALYSIS OF HEALTH EFFECTS RESULTING FROM POPULATION EXPOSURES TO AMBIENT PARTICULATE MATTER. HEALTH AND ENVIRONMENTAL EFFECTS DOCUMENT, 1985
J. D. SPENGLER Sep. 1985 77 p refs
(Contract DE-AC02-81EV-10731)
(DE86-002161; DOE/EV-10731/5) Avail: NTIS HC A05/MF A01

Findings from our recent epidemiologic analyses reported here indicate variations in ambient fine particle mass (d sub a 2.5 (MU)m toxic substances include arsenic, cadmium, sulfur, and carbonaceous compounds). SO4 sup = mass are more important to public health than variations in the levels of particle mass measures which also include coarse particles (d sub a 2.5 (MU)m). Sulfates and FP mass wsere often very significant predictors of variations in residual mortality throughout the US, even after controlling for socio-economic factors. Analysis of 12 years of daily mortality and air pollution in New York City showed that aerosol extinction coefficient (b sub ext), a good surrogate for fine particles, is significantly associated with observed mortality. DOE

N86-24209# Oak Ridge National Lab., Tenn.
FIBEROPTICS IMMUNOFLUORESCENCE SPECTROSCOPY FOR CHEMICAL AND BIOLOGICAL MONITORING
T. VO-DINH, G. D. GRIFFIN, K. R. AMBROSE, M. J. SEPANIAK, and B. J. TROMBERG 1985 17 p Presented at the 10th International Symposium on Polynuclear Aromatic Hydrocarbons, Columbus, Ohio., 21 Oct. 1985 Prepared in cooperation with Tennessee Univ., Knoxville
(Contract DE-AC05-84OR-21400)
(DE86-002239; CONF-851068-2) Avail: NTIS HC A02/MF A01

The feasibility of the fluoroimmuno-sensor (FIS) detection of IgG proteins tagged with fluorescein isothiocynate was demonstrated. In view of the biotechnological advances in the area of monoclonal antibodies and the production of anti-hapten sera it is believed that fiberoptics-based FIS could be generally useful in a wide spectrum of biochemical and clinical analyses. Specifically, the FIS could be employed in the assessment of an individual's exposure to chemical PAH carcinogens, response to drug therapy, or in the characterization of naturally occurring biochemicals. For example, studies investigating the presence of carcinogens and carcinogen-DNA adducts in tissues and body fluids could be performed with the FIS using immunochemical techniques. An integration of fluorescence immunoassay principles with laser-based fiberoptics systems is planned in order to develop FIS which should be capable of providing reliable analytical data for such studies. DOE

N86-24210# Los Alamos National Lab., N. Mex.
EFFECTS: DOCUMENTATION AND VERIFICATION FOR A BEIR 3 CANCER RISK MODEL BASED ON AGE, SEX AND POPULATION DYNAMICS FOR BIOTRAN
W. J. WENZEL and A. F. GALLEGOS Sep. 1985 108 p refs
(Contract W-7405-ENG-36)
(DE86-003285; LA-10371-MS) Avail: NTIS HC A06/MF A01

The computer simulation code EFFECTS is coupled with the radionuclide uptake and environmental transport strategies of the BIOTRAN code to predict cancer risks and deaths in a dynamic human population. Total mortalities due to all causes are incorporated with projected radiation-induced cancer mortalities caused by all previous chronic or acute radiation exposures of the population as a function of age and sex. Superpositioning radiation-induced cancer mortalities on current total mortalities in each age group allows a realistic and dynamic estimate of cancer risks for complex radiation exposure scenarios. EFFECTS was developed on the CDC 7600 and can be executed on the Cray computer system at Los Alamos National Laboratory. EFFECTS can simulate the upper boundary of cancer risk estimates where population exposures occur over many years and where organ burdens are integrated over the lifetime of the individual. This report gives new insight on age-specific cancer risks. As part of the code verification, the simulated impacts to a small population from natural background uranium and an accidental release of airborne plutonium are compared. For the long-term continuous exposure to natural background uranium, the impact to the population is very small (2 x 10(-6) to 7 x 10(-6) deaths/10,000 people) with young adults receiving the largest bone doses and risks. For the long-term intakes following a simulated accidental air release of plutonium, young teenagers receive the highest bone doses while young adults receive the largest risk. Simulating these two scenarios, using BIOTRAN/HUMTRN/EFFECTS, illustrates sufficient resolution to predict the age/sex-specific response from human populations from contaminants in our environment. DOE

N86-24211# Health Effects Research Lab., Research Triangle Park, N. C.
USING ASHFORD'S GENERAL MODEL TO AID IN THE UNDERSTANDING OF A PESTICIDE'S NEUROTOXIC EFFECT THROUGH PESTICIDE-DRUG MIXTURE EXPERIMENTS
D. J. SVENDSGAARD and K. M. CROFTON Nov. 1985 15 p
Prepared in cooperation with North Carolina Univ., Chapel Hill
(PB86-130028; EPA-600/D-85-241) Avail: NTIS HC A02/MF A01 CSCL 06T

A framework for interpreting the joint action of mixtures of drugs is discussed. The concepts are applied to the situation in which the mechanism of three drugs are fairly well understood and mixtures of pesticides and drugs are studied to aid in the understanding of the mechanism of certain types of pesticides. Laboratory data are fit by nonlinear regression to suggested models. The conclusions drawn from fitting these models and the implication of the design of experiments for further studies are discussed. GRA

N86-24212# Resources for the Future, Inc., Washington, D. C.
EXECUTIVE SUMMARY: AMBIENT OZONE AND HUMAN HEALTH: AN EPIDEMIOLOGICAL ANALYSIS Final Report
P. R. PORTNEY and J. MULLAHY Aug. 1985 23 p
(Contract EPA-68-02-3583)
(PB86-114089; EPA-450/5-85-005D) Avail: NTIS HC A02/MF A01 CSCL 06T

The report by the Office of Air Quality Planning and Standards of the Environmental Protection Agency is the executive summary of an analysis of the relationship between ozone and human health benefits. GRA

N86-24213# Resources for the Future, Inc., Washington, D. C.
AMBIENT OZONE AND HUMAN HEALTH: AN EPIDEMOLOGICAL ANALYSIS, VOLUME 3 Final Report
P. R. PORTNEY and J. MULLAHY Jun. 1985 180 p refs
(Contract EPA-68-02-3583)
(PB86-114105; EPA-450/5-85-005C) Avail: NTIS HC A09/MF A01 CSCL 06F

The report is the third volume by the Air Quality Planning and Standards Office of EPA of an analysis of the relationship between ozone and human health benefits. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-29851
SYMPOSIUM ON AVIATION PSYCHOLOGY, 3RD, COLUMBUS, OH, APRIL 22-25, 1985, PROCEEDINGS
R. S. JENSEN, ED. and J. ADRION, ED. (Ohio State University, Columbus) Symposium sponsored by the Ohio State University and Association of Aviation Psychologists. Columbus, OH, Ohio State University, 1985, 777 p. For individual items see A86-29852 to A86-29861, A86-29863 to A86-29936.

The present conference on the complex interactions between pilots and their cockpit environments discusses topics in such fields as cockpit design, voice data entry for avionics, cockpit displays, air traffic control automation, pilot workload monitoring and management, pilot judgment and reliability, cockpit communications and resource management, pilot selection and training, pilot visual perception, pilot physiology, and accident investigation. Specific attention is given to cockpit design and evaluation data bases, ergonomic principles for auditory signals in military aircraft, subjective assessments of workloads in an advanced fighter cockpit, time-sharing ability in zero-input tracking analyzer scores, cockpit speech interference considerations, psychosocial aspects of male and female pilot errors, test anxiety in cockpit simulators, fatigue, stress and preoccupation effects, and aircraft accident investigation psychological methods. C.D.

A86-29853#
VISION IN SPATIAL DISORIENTATION (SDO) AND LOSS OF SITUTATIONAL AWARENESS
G. B. MCNAUGHTON (USAF, Life Support System Program Office, Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 25-38. refs

The pilot-vehicle interfaces (PVIs) of current fighter and attack aircraft are noted to have been designed without sufficient attention to pilot orientation factors and requirements. Pilots are accordingly denied important cues, or subjected to cues that under certain circumstances disorient, misorient, or otherwise fail to furnish critical control parameters in a way that enhances information acquisition. There has been an additional failure to design PVIs that provide the inputs needed by a pilot to maintain or quickly regain awareness of attitude and other critical flight parameters. Recommendations for future PVI designs are made. O.C.

A86-29863#
THE EFFECT OF USING SPEECH GENERATION AND RECOGNITION SYSTEMS ON THE PERFORMANCE OF DISCRETE TASKS
D. DAMOS (Arizona State University, Tempe) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 127-133.
(Contract N00014-92-C-0179)

Twenty-eight male subjects performed a task combination consisting of a spatial short-term memory task and a verbal short-term memory task. Stimuli for the verbal task could be presented either visually on a CRT or auditorily through headphones. Subjects responded to the verbal task either manually using a keypad or vocally using a voice recognition system. Analyses revealed significantly more accurate dual-task performance with auditory rather than visual stimuli. However, there was no significant difference between speech responses and manual responses on measures of either speed or accuracy.
Author

A86-29865#
COMPARISON OF NOVICE AND EXPERIENCED PILOTS USING ANALOG AND DIGITAL FLIGHT DISPLAYS
J. M. KOONCE, M. GOLD, and M. MOROZE (Massachusetts, University, Amherst) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 143-149. refs

Attention is given to the differences in performance of flight-naive and experienced pilots in the acquisition of restrictive flight skills using both digital and analog flight display formats and in their performance under high cognitive workload stress. The results obtained indicate that the performance of basic flight tasks is superior when analog displays are used, in the cases of both the acquisition of those skills and their performance in the presence of a cognitively demanding side task. The naive subjects appeared to perform better than the experienced pilots with digital displays.
O.C.

A86-29867*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PITCH CHANGE THRESHOLDS AS INFLUENCED BY ANGULAR RATE AND DURATION OF THE APPARENT HORIZON'S DISPLACEMENT
R. F. HAINES (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 159-166. refs

The displacement threshold (DT) during voluntary visual tracking of a line and during fixation of a stable spot located at the initial stimulus position was determined to help in the modeling pilot manual dynamics during the nose-up 'flare' maneuver. Forty-six observers made paired comparison, forced choice judgments of the maximal downward displacements of a horizontal line moving at various speeds for the durations of 0.25, 0.50, and 1.00 sec. The results indicated that the DT is significantly lower, the confidence is higher, and the number of errors and guesses is smaller when a fixation dot is present; moreover, increasing both the stimulus velocity and duration significantly improves the accuracy of displacement discrimination and increases mean confidence.
I.S.

A86-29879*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREDICTED VERSUS EXPERIENCED WORKLOAD AND PERFORMANCE ON A SUPERVISORY CONTROL TASK
V. BATTISTE and S. G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 255-262.

The multitask simulation of a supervisory control system was examined in order to evaluate the ability of operators to predict the workload and performance impact of unfamiliar task features, using their basic knowledge and specific information provided before each scenario. Task difficulty and experienced workload were varied by manipulating the number of elements per task, the number of tasks, task schedule, and availability of task elements for performance. The results have indicated that an operator might correctly predict the workload of a realistically complex task if (1) he is familiar with the basic system, and (2) the design, functional requirements, and operational procedures of the proposed modifications are described clearly. He is less able to predict unfamiliar rate or schedule complexity manipulations for which timing is an important element.
I.S.

A86-29882#
IN SEARCH OF A TIME-SHARING ABILITY IN ZERO INPUT TRACKING ANALYZER SCORES
G. D. SIERING and L. W. STONE (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 279-286. refs

The Zero Input Tracking Analyzer (ZITA) is a small psychomotor test that attempts to measure time-sharing ability by use of tracking tasks performed with and without a secondary task. Scores from a sample of Army aviators were intercorrelated and factor analyzed. Separate factors were identified for a time-sharing dimension and for a general ability to perform higher order tracking tasks. Three other factors were extracted and interpreted. The results are interpretable as demonstrating the existence of a time-sharing ability that is separate from the ability to perform various types of tracking tasks.
Author

A86-29883#
THE STERNBERG MEMORY SEARCH TASK AS AN INDEX OF PILOT WORKLOAD
C. D. WICKENS, F. HYMAN, J. DELLINGER, H. TAYLOR, and M. MEADOR (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 287-294. refs
(Contract DAMD17-83-C-3150; F33615-83-K-0612)

Studies of Taylor et al. (1985) concerning application of the Sternberg memory search task for evaluating pilot's mental work load and the residual capacity are reanalyzed and compared with earlier investigations. Based on the results, a number of recommendations is offered with respect to some particular details in the Sternberg task procedure. In particular, it is proposed to (1) minimize peripheral input-output delays, (2) avoid using the memory sets (MSETs) of 1 point, and avoid using the same fixed MSET for too many consecutive trials, (3) avoid running different MSETs on different days or blocks, and (4) collect data on large number of subjects. Statistically, presentation of raw data points, rather than derived statistics from regression equations, is recommended.
I.S.

A86-29884#
RELIABILITY OF MILITARY PILOTS - PROBLEMS AND PROSPECTS
B. O. HARTMAN, R. A. ALBANESE (USAF, School of Aerospace Medicine, Brooks AFB, TX), and G. B. HUMPHRESS (Southwest Research Institute, San Antonio, TX) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 297-307. refs

The objectives of the USAF physiologic training program are threefold: (1) to identify the top 20 percent of the operational fighter pilot pool, (2) to develop special training techniques for making each member a 99th percentile pilot, and (3) to develop biologically based designs for the pilot/aircraft interface. The elements of the training objective (cognitive skills training, sensory/motor skills training, and operational skills training) and the principal techniques, training protocols, the software, and the mathematical models involved are discussed. Establishing local, artificially intelligent training work stations, the 'Challenge Work Stations' is proposed, to serve as a device to support locally the training and maintaining pilot attributes conditioning. The functions of each Challenge Work Station will be those of a coach: (1) to

present challenges, (2) to record, maintain, and trend scores on individual challenges, upon request, (3) to serve as a personal aid and tutor for individual pilot, (4) to tailor training prescriptions and advisories to every pilot's individual circumstances, and (5) to use feedback from actual cockpit performances by the pilot. I.S.

A86-29885#
THE SOCIAL-PSYCHOLOGICAL ASPECTS OF PILOT-ERROR - MALE VS FEMALE
G.J. VAIL (St. Mary's Graduate Institute, Minneapolis, MN) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 309-319. Research supported by the Ninety Nines, Inc. refs

The National Transportation Safety Board data on pilot-error fatalities for general aviation, years 1977 through 1981, have been analyzed by gender differences. The analysis included following variables: (1) age of pilot, (2) certificate of pilot, (3) kind of flying, (4) type of aircraft, (5) type of power, (6) total time, by time in type of aircraft, (7) broad cause/factor, (8) specific cause/factor, (9) phase of operation, and (10) pilot's occupation. When compared to the total population of female and male pilots, the relative number of female pilot-error fatalities was significantly less than the number of male pilot-error fatalities. On the other hand, female pilots incur more of their fatalities when flying solo-instructional than male pilots (11.1 pct and 1.5 pct, respectively). Females also incurred relatively more of their fatalities during practice-noncommercial runs (9.3 pct compared to 2.4 pct for males). I.S.

A86-29886*# Ohio State Univ., Columbus.
A REVIEW OF CRITICAL IN-FLIGHT EVENTS RESEARCH METHODOLOGY
W. C. GIFFIN, T. H. ROCKWELL, and P. E. SMITH (Ohio State University, Columbus) IN: Symposium on Aviation Phychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 321-328. refs
(Contract NAG2-112; NAG2-75; NAS2-10047)

Pilot's cognitive responses to critical in-flight events (CIFE's) were investigated, using pilots, who had on the average about 2540 flight hours each, in four experiments: (1) full-mission simulation in a general aviation trainer, (2) paper and pencil CIFE tests, (3) interactive computer-aided scenario testing, and (4) verbal protocols in fault diagnosis tasks. The results of both computer and paper and pencil tests showed only 50 percent efficiency in correct diagnosis of critical events. The efficiency in arriving at a diagnosis was also low: over 20 inquiries were made for 21 percent of the scenarios diagnosed. The information-seeking pattern was random, with frequent retracing over old inquiries. The measures for developing improved cognitive skills for CIFE's are discussed. I.S.

A86-29887#
THE SCARE PILOT
J. L. PARNELL (Icarus, Inc., Houston, TX) IN: Symposium on Aviation Psychology. 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 329-336. refs

The roots of pilot's 'human errors', in reality caused by faulty or inconsistent designs in an aircraft, deficient pilot's operating handbook (POHB's), stress or outright fear are discussed with examples for each type of situation. It is concluded that fear-caused panic is often uncontrollable, but the emergency reflex-like actions taken in extreme emergencies are often the correct ones. However, some emergencies cannot be practiced in real flight situation (e.g., fire in the cockpit, a tire blowout on landing), and can be taught in classroom only by instructors who have actually experienced these emergency situations themselves. The importance of finding the true reasons in every 'pilot error' event is emphasized, for these must be used as guides for future airplane designs, pilot screening and upgrading of instructors. I.S.

A86-29888#
JUDGMENT TRAINING EFFECTIVENESS AND PERMANENCY
G. P. BUCH (Transport Canada, Toronto) and I. J. DE BAGHEERA (Montreal, Universite, Montreal, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 337-343.

Partial results of a study evaluating the relative permanency of acquired skills and the effectiveness of a judgment training (JT) program for student pilots, conducted at a three-year college, are presented. Twenty flight and ground instructors underwent a 14-d intensive course on the study of the JT principles, followed by a 16-week control period. Aggressiveness and anxiety tests were administered to students in their first year. In the course of their second year, but prior to receiving the Student Judgment Manual, a written pretest dealing with flight judgmental instances was administered along with a personality trait test. Teaching styles and initial reaction of judgment training are discussed. One result of the study was a higher quality of judgment achieved by the second-year students, as compared with the more experienced third-year group. The cause for this is believed to lie in the close contact of the less experienced group with their instructors, who were carrying out their own training. I.S.

A86-29889#
RECURRENT COCKPIT RESOURCE MANAGEMENT TRAINING AT UNITED AIRLINES
R. L. ARNOLD and D. L. JACKSON (United Airlines Denver Training Center, Loveland, CO) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 345-351.

Cockpit Resource Management (CRM) training is an integral part of United Airlines' recurrent training program. Each flight crewmember is trained and checked once per year. Crews participate in all training and checking activities as a crew unit. The training and checking is spread over three consecutive days. On day one, crews participate in a structured exercise designed to review and apply CRM techniques. On day two, the crews perform line oriented flight training (LOFT) in a flight simulator. The LOFT is guided by a scenario structured to promote crew application of CRM principles. A problem is introduced, and the outcome of the LOFT is dependent upon how the crew deals with the problem. The LOFT session is video taped for post session critique. Crews are given a flight check on day three. Efforts are under way to develop assessment scales for CRM application. Author

A86-29890#
PRIVATE PILOT JUDGMENT TRAINING IN FLIGHT SCHOOL SETTINGS - A DEMONSTRATION PROJECT
L. F. LESTER (Colby College, Waterville, ME), A. E. DIEHL (FAA, Office of Aviation Medicine, Springfield, VA), and G. BUCH (Canadian Air Transportation Administration, Ottawa, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 353-365. refs

A86-29891#
WHEN SHOULD PILOT DISCIPLINE END AND PILOT SAVVY BEGIN?
J. N. KOMICH (Flight Safety Institute, Sacramento, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 367-371.

Case studies of several fatal accidents and of incidents where a seemingly imminent crash has been avoided by an unusual maneuver are presented. In some extenuating circumstances a crash was prevented by a procedure not covered by a pilot manual. In others, a prescribed procedure was misleading due to unusual situations, but the thoroughly conditioned pilot was unable to depart from the learned procedure. Changes in the airline captain evaluation and in recurrent training process are suggested, which include greater emphasis on the quality, rather than quantity, of

flight time and teaching the pilot to analyze each flight for unique or unusual occurences in the flight. Simulators should provide greater variety of situations, simulating actual cities and circumstances. Finally, every pilot should have access to other pilots' experiences of having avoided a near-crash situation. I.S.

A86-29892#
THE ATTITUDE AND INFORMATION COMPONENTS OF THE RISK ASSESSMENT-JUDGEMENT PROCESS
J. KRAMER IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 373-380. refs

The FAA regulations regarding the individual's rights to 'voluntary exposure to risk' and the 'rights to incur risk' to others are discussed in light of existing hazards and incompliances to prescribed safety procedures which exist in the area of personal and business aviation. The attitude of pilots towards safety is analyzed, and the examples of accidents caused by a macho attitude, alcohol and drug abuse, and negligence towards one's health problems are presented. The existing FAA flight test guides are found inadequate, especially with respect to 'other than standard' take-off conditions and to aircraft manufactured prior to March 1979. A realignment of the Biennial Flight Review, which is the only mechanism available for judgement training of the general aviation pilot, is suggested. I.S.

A86-29894#
'CAPTAIN I WAS TRYING TO BRING UP THE FACT THAT YOU MADE A MISTAKE EARLIER' - DEFERENCE AND DEMEANOR AT 30,000 FEET
R. M. FRANKEL (Wayne State University, Detroit, MI) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 403-410. refs

Results of a NASA-sponsored study, which uses videotechnology and microinteractional analysis to identify the rules and structures of the mutual participation of the crew in the cockpit, are presented. The report focuses on the analysis of a conversational sequence between an air traffic control voice and the crew in the cockpit of a flight simulator, which involves the occurence of an uncorrected error on the part of the flight captain. While the original error was caused by an interactional complexity, with the 1st pilot being simultaneously engaged in three different conversation sequences, the reason for perpetuation of the error was found in the attitude of deference and demeanor on the part of a subordinate pilot who knew about the error. I.S.

A86-29895#
COCKPIT SPEECH INTERFERENCE CONSIDERATIONS
W. T. SHEPHERD (FAA, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 411-417. refs

The problem of cockpit interference by aircraft-generated noise and the levels of interference for different aircraft are discussed, together with the means to minimize the interference. The measures of acceptability of a cockpit noise environment, the Articulation Index, the Speech Interference Level (SIL), and the Preferred SIL (PSIL) are described; their values as quantitative criteria are compared; and the threshold values of these criteria are indicated. Among the devices and means commonly recommended for increasing the speech-to-noise ratio, the use of intercom systems with noise-cancelling microphones is found to be the only effective practical method. I.S.

A86-29896#
THE ROLE OF FUNDAMENTAL EXPRESSION IN INSTRUMENT FLIGHT PERFORMANCE
C. E. MCCOY (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 419-426. refs

The application of the expressive or qualitative aspects of communication to instrument flight is discussed. How these expressive aspects affect pilot performance is examined. The role of phenomenology in the relationship between pilot and aircraft is addressed. C.D.

A86-29897#
AN ANALYSIS OF THE DEARTH OF ASSERTIVENESS BY SUBORDINATE CREWMEMBERS
J. N. KOMICH (Flight Safety Institute, Sacramento, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 431-436.

The problem of an aberrant decision made by the flight captain and remaining unchallenged by the subordinate crewmembers is analyzed. The roots of the problem are seen in the occasional professional inadequacy and/or in the personality of a 'too strong' captain, in the desire of the crew to maintain harmony in the cockpit, and in the 'captain mystique' concept, supported at all levels of aviation bureaucracy. To alleviate this so called 'lack of assertiveness' in the supporting crew, it is suggested that a method be developed that quantitates all aspects of the flight regime. Such quantitative parameters would facilitate the 'out of limits' definition of the flight, which would reduce the subjectiveness of pilots' decisions and judgments, and, in addition, would provide the subordinate crewmembers with concrete basis from which to speak. The need to further stiffen the quality checks by the ATP and to support a crewman who speaks up is emphasized. I.S.

A86-29898#
COCKPIT RESOURCE MANAGEMENT - WHERE DO WE STAND?
B. STRAUCH (National Transportation Safety Board, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 437-443. refs

Unresolved issues of the cockpit resource management (CRM) programs, such as definition of the program's objectives, addressing specific objectives to each crewmember's position, and evaluation of program's effectiveness for maximal retaining, are discussed. Consideration is given to critical variables that can influence individual CRM skills: experience level, sociocultural and sociopsychological factors, and instructional media. Special emphasis is made on the need to correlate the CRM program development with the instructional systems design methods, in order to guide the CRM program developer to specific, obtainable objectives. I.S.

A86-29899*# Texas Univ., Austin.
COCKPIT RESOURCE MANAGEMENT - EXPLORING THE ATTITUDE-PERFORMANCE LINKAGE
R. L. HELMREICH (Texas, University, Austin), H. C. FOUSHEE (NASA, Ames Research Center, Moffett Field, CA), R. BENSON, and W. RUSSINI (People Express Airlines, Newark, NJ) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 445-450. refs
(Contract NAG2-137; NCC2-286)

Measured attitudes regarding cockpit management were contrasted for pilots whose line flying performance was independently evaluated by check airmen as above or below average. A highly significant discriminant function was obtained indicating that these attitudes are significant predictors of behavior. The performance of 95.7 percent of the pilots was correctly classified by the analysis. Implications of the results for cockpit

resource management training and pilot selection are discussed. Author

A86-29900#
FORMULA FOR A BETTER UNDERSTANDING OF PILOT PERFORMANCE
L. V. CURRERI (Cigna Corp., Windsor Locks, CT) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 451-458. refs

The factors of motivation and ability in the Vroom's formula (which evaluates human performance as a multiplicative function of motivation and ability), as they apply to the training of pilots, are discussed. The most important issues in the ability factor include the need of effective communication among the crewmembers, especially in cases of negative experiences, and the need to correlate the individual behavioral traits with the requirements of the new technical skills. The aspects of the motivation factor include performance standards, responsibility, rewards, and team spirit, as well as 'hygienic factors' of job security, fair play, and working conditions. Although the hygienic factors cannot motivate by themselves, they are prerequisites for motivation. The need to integrate the motivation programs into pilots' technical training is emphasized. I.S.

A86-29901#
THE INFLUENCE OF PREVIEW PERIOD AND GLOBAL OPTICAL FLOW RATE ON SENSITIVITY TO LOSS IN SPEED OF SELF MOTION
D. H. OWEN, I. E. PALLOS, L. J. HETTINGER, and J. C. FOGT (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 459-466. refs
(Contract F33615-83-K-0038)

The effects of the preview period and the global optical flow rate on the judgment of one's own speed were evaluated, using a special purpose scene generator. A test event consisted of seven preview segments, in the 0-40 s range, of constant speed followed by a 10-s segment of either constant speed or constant-rate deceleration. The subjects were to mark the initiation of their perception of deceleration by pressing a button. Six optical flow rates, ranging from 1.63 to 26.1 eyeheights/s crossed with the constant speed motion. The results indicate that the errors of reporting 'constant speed' on deceleration trials increase at first, then decrease as the preview period increases on duration, whereas the reaction times between initiation of deceleration and the button press show an opposite effect. Errors of reporting 'deceleration' on constant speed trials were relatively constant over preview durations of up to 20 s, then rose between 20 and 40 s. Implications for optimizing observation time before initiating a control adjustment and for video simulation of high-speed self motion are discussed. I.S.

A86-29902#
THE EFFECTS OF PREVIEW PERIOD ON DESCENT DETECTION
A. E. JOHNSON and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 467-473. refs
(Contract F33615-83-K-0038)

Preview period (segments of level flight preceding a test segment), fractional loss in altitude, and event type (level or descent) were factorially crossed to investigate their influence on the ability of observers to detect descent. Observers made 'level' or 'descent' judgments and rated how confident they were in their decision while viewing computer-generated events which represented either descent or level flight. For level trials, the fastest reaction times resulted from preview periods between 1.25 and 5.0 s. Errors and reaction times decreased as the rate of fractional loss increased. Methodological and practical implications of the findings are discussed relevant to developing systems which optimize an individual's ability to control the altitude of an aircraft. Author

A86-29903#
SOURCES OF OPTICAL INFORMATION AND THEIR METRICS FOR DETECTING LOSS IN ALTITUDE
L. WOLPERT and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 475-481.
(Contract F33615-83-K-0038; AF TASK 2313T3)

This experiment was designed to test the usefulness of two metrics for optical information specifying loss in altitude. Eyeheight and ground-texture-unit metrics were contrasted at three levels of global optical flow rate under conditions of constant and accelerating flow. Observers were required to make 'descent' or 'level' judgments based on 15-s computer-generated events simulating level flight or loss in altitude. Analyses of errors and response latencies indicated that the eyeheight metric was more functionally relevant than the ground-texture-unit metric and that performance decrements occurred with increases in flow rate. Likewise, better performance resulted with constant optical flow than with optical flow acceleration. These results and their implications for theory of self-motion perception and for the control of high-speed, low-level flight are discussed. Author

A86-29904#
INCREASING SENSITIVITY TO OPTICAL INFORMATION SPECIFYING LOSS IN ALTITUDE
L. J. HETTINGER and D. H. OWEN (Ohio State University, Columbus) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 483-490. refs

An experiment was conducted to assess the effect of training with advance information sensitivity to visual information specifying loss in altitude. Two groups of observers were assigned to two training conditions, designated as 'easy' and 'difficult', and were tested in four separate sessions, the last three being preceded by training sessions. Both groups showed significant improvement in discriminating descent from level flight. Although no significnat effect of training condition was observed, the overall trend was for difficult training to result in more sustained and, in the end, more effective learning. Previously observed negative effects of high values of global optical flow rate on descent detection diminished with training. Distinctions between fast and slow learners are drawn, and the results are discussed in terms of their relevance to perceptual learning theory and pilot training. Author

A86-29905#
ALTITUDE ESTIMATION OF PILOT AND NON-PILOT OBSERVERS USING REAL-WORLD SCENES
E. J. RINALDUCCI, M. J. PATTERSON, M. FORREN, and R. ANDES, JR. (Georgia Institute of Technology, Atlanta) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 491-498. refs

The present investigation was primarily concerned with the perceptual factors associated with low altitude flight, and was directed towards the assessment of the ability of pilots to accurately estimate altitude using a psychophysical technique. Pilot and non-pilot observers in the study were required to estimate altitude from photographs taken at different altitudes over six terrain areas in the Southwestern United States. These terrain areas differed in various cue factors such as object density, objects of known size, vertical development, and shading. In general, the results indicated that pilots were more accurate in their estimates than non-pilots, but both groups showed a similar pattern of responding to the different terrains. The ability of pilots and non-pilots to estimate altitude appeared to depend upon the presence of certain cue factors. Recommendations are made relative to the assessment of pilot's ability to estimate altitude before and after low altitude flight training. Author

A86-29906#
SIMULATED TERRAIN FOLLOWING FLIGHT - VISUAL AND RADAR TERRAIN CORRELATION REQUIREMENTS
D. MCCORMICK (Singer Co., Link Flight Simulation Div., Sunnyvale, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 499-503.

The components of a Weapon System Trainer (WST), used in training military pilots for the hazardous low altitude terrain-following flight (TF) missions are described. A WST consists of an aircraft simulator within an interactive tactical environment, provided by a computer data base. Visual imagery, representing out-the-window scenes, infrared, or Low Light Level TV image scenes, is provided by a Computer Image Generator, whereas the corresponding, and more accurate, radar terrain information is supplied by a Digital Radar Land Mass System. The amount of correlation needed for the two systems in different types of flight is discussed. A correlation error where the visual terrain is at an altitude greater than 10 percent of the TF altitude above the radar terrain is a potential source of pilot detected, WST generated TF system failure. I.S.

A86-29907#
PERCEPTION OF ALTITUDE IN THE LOW AND MEDIUM ALTITUDE RANGES
J. DE MAIO (Honeywell, Inc., Minneapolis, MN) and R. BROOKS (USAF, Human Resources Laboratory, Williams AFB, AZ) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 505-512. refs

The effectiveness of computer-generated imagery in providing visual cues needed for perception of altitude above ground level (AGL) was evaluated from the results of a magnitude estimation task presented to 33 pilots. Subjects estimated AGL altitude after viewing videotaped presentation of five two-dimensional square patterns, which ranged in area from 450-ft x 450-ft to 4000-ft x 4000-ft. The accuracy of perception was indexed by the slope of a regression line of log perceived altitude on log presented altitude. The results show that accuracy of perception is a function of log altitude. Among the three visual scene features examined: the squares, the sides of the squares, and the square corners, the corner density was by far the best predictor of estimation slope. The corner density required to support accurate altitude estimation decreased with altitude: e.g., six corners/sq mile were required at the altitude of 2233 ft, as opposed to nine corners/sq mile at 629 ft. I.S.

A86-29908#
CANADIAN AUTOMATED PILOT SELECTION SYSTEM
J. A. JAMES (Department of National Defence, Canadian Forces Personnel Applied Research Unit, Willowdale, Canada) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 513-519.

The Canadian Automated Pilot Selection System (CAPSS) designed for psychomotor testing of airforce candidates is described, including such details as the simulator test facility, the analysis center, the syllabus, the instruction and testing audio-visual system, and the performance feedback. CAPSS is based on a 'job sample' approach, in which the candidates are required to perform a standard set of exercises involving flight tasks representative of those required in learning to fly a light aircraft. The test produces reliable measures of such behavioral characteristics and abilities as basic psychomotor abilities, learning rates, multiple-task integration, and performance under overload. Although variations of the job sample approach were found to be not cost-effective in the U.S., this is believed to be due to the decentralized character of the U.S. testing system and to the much greater numbers of the candidates to be tested. I.S.

A86-29909#
AN EXPLORATORY STUDY OF COMPUTER-BASED AVIATOR TESTING
R. BRAUNE, A. STOKES, and C. D. WICKENS (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 521-528. refs
(Contract N00204-82-C-0113)

The data obtained by Braune and Wickens (1984) during the 'Functional Age Profile' validation test for aviators are reanalyzed, to test the information processing performance battery's predictive power at a level independent of age-related changes. A total of fifty single and dual task performance variables were submitted to a stepwise multiple regression analysis. The results on correlations of selected single and dual task measures with the primary flight performance measures and the secondary communications task are discussed. I.S.

A86-29910#
TEST ANXIETY IN THE SIMULATOR ENVIRONMENT
J. F. HANSON (Republic Airlines, Inc., Ann Arbor, MI) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 529-532.

The aspects of test anxiety particular to the environment of a periodic simulator checkride for airline pilots are discussed. A succession of four stages of the test anxiety phenomenon: (1) recognition by the pilot of a test situation, (2) initial reaction, (3) mental state changes, referred to by psychologists as 'A-state' reaction, and (4) self-inspection and reaction are analyzed. Measures that can help to eliminate or alleviate stages (1) and (2), and to help the subject to develop a positive, rather than negative reaction in stages (3) and (4), or at least to alleviate the negative impact of these stages, are suggested. I.S.

A86-29911
MICROPAT - A PROGRESS REPORT ON THE VALIDATION OF AN AUTOMATED TEST BATTERY FOR PILOT SELECTION
H. C. A. DALE (Bartdale, Ltd., Beverley, England) and D. BARTRAM (Hull, University, England) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 533-539. Research supported by the Army Personnel Research Establishment. refs

The Micropat test system, developed to improve the selection of Army helicopter pilots, is described. The current Micropat library contains the following tests: (1) adaptive tracking, (2) compensatory tracking, (3) risk, (4) signal detection, (5) dual-task (two-dimensional step tracking and a mental arithmetic test), (6) landing, (7) schedule assessing, and (8) memory span. The results of a validation study have shown that intercorrelations between the pass/fail within the sample and P-score were in most cases low, indicating that most measures are independent both of each other and the P-score. The schedule, risk, and subject-controlled tracking tests, predict aspects of criterion variance unaccounted for by the traditional tests incorporated in the P-score. I.S.

A86-29912#
STUDENT PILOT STRESS - AN EMOTIONAL BARRIER TO EFFICIENT FLIGHT TRAINING
I. HENLEY (Transport Canada, Winnipeg) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 541-549. refs

Research has shown that learning to fly is a stressful experience and that stress impedes learning, impairs performance and interferes with decision making processes. To obtain optimal training efficiency, one of the necessary functions of the flight instructor should be to assist to bring about a reduction in the stress level of the student should that stress level be detrimental to efficient learning. Unfortunately, a disturbing finding by researchers in the field of flight training reveals that frequently flight instructors, instead of alleviating stress, impose additional stress on the student pilot. Research addressing the issue of

providing special educational training to flight instructors is in progress. This paper considers the issue of flight instructor training emphasizing the recognition of emotional barriers experienced by students in flight training and the reduction of student pilot stress. Author

A86-29913#
A CONTROL THEORY MODEL OF AVIATOR BEHAVIOR
B. A. SMITH (Singer Co., Link Flight Simulation Div., Binghamton, NY) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 551-558. refs

The Control Theory Model of Shipley and Smith (1980) is applied to describe student behavior during training in a General Aviation Trainer. Four groups of subjects received cognitive training at different times during the acquisition of motor skills associated with a basic flight maneuver. Subject performance was displayed in the form of learning curves and analyzed by use of Taylor's theorem. It was found that the individual subject's learning curves contained 'quantum jumps' from one level of performance to another, with an inflection point in the learning curve preceding the onset of these jumps. The inflection points occurred sooner in subjects receiving more cognitive training than in those with less cognitive training. The performance level at which the inflection point occurred was virtually the same for all groups. I.S.

A86-29914#
A PRELIMINARY STUDY - A MULTIVARIATE ANALYSIS OF ATTITUDINAL CHARACTERISTICS OF FLIGHT INSTRUCTORS
R. A. BUCKINGHAM and S. R. WIERSTEINER (Indiana State University, Terre Haute) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 559-566. refs

A86-29915#
PROFESSIONAL FLIGHTCREW HUMAN RESOURCE DEVELOPMENT DEVELOPING A NEEDS ASSESSMENT PROGRAMME
G. J. F. HUNT (Massey University, Palmerston North, New Zealand) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 567-574. refs

The short-term and long-term goals of New Zealand's Needs Assessment Program of the professional development of the country's pilots are described. The general issues of the program established in the Feasibility Study phase include the areas of pilot judgment, cockpit management, the need for an applicable attitude modification program and instructional competency for various pilot categories. Additional issues involve educational qualifications, the education and training programs in aviation schools and their cost, and the aspects of the program affecting the Civil Aviation Division. To implement the program, three project areas were established: Human Factors, Flight Training, and Civil Aviation Development, with a committee for each project area co-chaired by a senior aviation expert and an academic specialist. I.S.

A86-29919#
THE EFFECTS OF PSYCHOPHYSICAL MATCHING ON THE TRANSFER OF TRAINING BETWEEN ALTERNATIVE MOTION SIMULATORS
J. M. FLACH (Illinois, University, Urbana), G. R. MCMILLAN, R. WARREN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH), and M. K. SNELL (Systems Research Laboratories, Inc., Dayton, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 601-608. refs

Psychophysical matching techniques were employed to equate the subjective experience of motion in two motion simulation devices - the RATS, a whole-body motion environment and the ALCOGS, which presented motion cues through a moving seat-pan. The psychophysical matching technique was designated SIGMA, for Subjective Interactive Gain Measurement Analysis. Use of the motion drive algorithm, derived using SIGMA, resulted in equivalent roll-axis tracking performance between the two simulators. However, training subjects in the ALCOGS using this motion drive algorithm did not result in better transfer between simulators than training with no motion cues. Author

A86-29921#
KNOWING WHAT WE GET FROM TRAINING DEVICES - SUBSTITUTING A LITTLE ARITHMETIC FOR A MEASURE OF EMOTION
J. M. ROLFE, J. R. COOK (Royal Air Force, Support Command, London, England), and C. G. DUROSE IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 617-624. refs

The problem of making an objective assessment of the effectiveness of the training provided by a flight simulator or a training aircraft is discussed. The concept of the percentage utilization of a flight simulator is explained. Special consideration is given to an assessment scheme, called relative training effectiveness, that converts combined subjective judgments on the aircraft training characteristics and the effectiveness of learning of individual exercises into an objective measure. Use of this method is recommended during the course of training on a given device for optimizing the time needed for learning a particular skill. I.S.

A86-29923#
COMPARISON OF THE EFFECTS OF ATROPINE SULFATE AND ETHANOL ON PERFORMANCE
J. A. DELLINGER, H. L. TAYLOR, and B. C. RICHARDSON (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 631-638. refs
(Contract F33615-83-K-0612; DAMD17-83-C-3150)

The flight simulator performance decrements resulting from atropine injections were compared to similar decrements resulting from ethanol toxicsis. Twenty volunteers received 0.0, 0.5, 1.0, 2.0 and 4.0 mg/75 kg of atropine sulfate under double-blind conditions. The performance decrements at each atropine sulfate treatment level for each subject were determined by computing RMS deviations for five flight performance variables. The data set from a previous study concerned with the effects of ethanol on pilot performance was reanalyzed, and the decrements for the five variables at the 0.082 percent blood alcohol level (BAL) were computed. Probit analysis was used to estimate the Effective Dose (ED50) at which 50 percent of the subjects in the atropine sulfate experiment were expected to display decrements in excess of those observed for the 0.082 percent BAL. The ED50 was 3.12 mg of atropine sulfate. Author

A86-29924#
PSYCHOLOGICAL RECOVERY AFTER INCIDENTS AND ACCIDENTS WITHIN AVIATION
J. TERMOEHLEN IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 639-644.

A86-29925#
FITNESS-FOR-DUTY, A PILOT'S VIEWPOINT
H. L. SPROGIS (Aviation Research Associates, Ltd., Los Angeles, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 645-652.

No more relevant examination of pilot reliability can perhaps be undertaken than that which overviews the pilot's fitness-for-duty both physically and mentally. Aviation is special to the needs and requirements of maintaining exacting standards of fitness. This paper attempts to define fitness-for-duty and additionally suggests a fitness-for-duty model that may be of assistance to pilots, management, and researchers. Finally, from the model, some principals have surfaced which may help in the further investigation of this critical problem of fitness-for-duty, and how pilots might react to certain solutions. Author

A86-29926#
THE ROLE OF THE FLIGHT PSYCHOLOGIST IN THE RNLAF iN A/C ACCIDENT INVESTIGATION AND PREVENTION
F. H. J. I. RAMECKERS (Royal Netherlands Air Force, Behavioral Sciences Dept., The Hague) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 653-660.

A86-29928#
TRAINING AIRCRAFT ACCIDENT INVESTIGATORS USING SIMULATIONS
J. ROLFE and A. F. TAYLOR (Cranfield Institute of Technology, England) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 669-676.

A86-29930#
'THE CAUSES OF CAUSES' - DETERMINANTS AND BACKGROUND VARIABLES OF HUMAN FACTOR INCIDENTS AND ACCIDENTS
K. GERBERT and R. KEMMLER (DFVLR, Institut fuer Flugmedizin, Fuerstenfeldbruck, West Germany) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 683-690.

The kind of human errors most frequently responsible for in-flight accidents and the primary causes of the errors are discussed. The most frequent critical errors were found to be the delay or omission of necessary actions/reactions (57.5 pct), failure to maintain altitude (41.5 pct), misjudgment of weather conditions encountered enroute (30.2 pct), failure to maintain airspeed (23.2 pct), and misjudgment of distances (21.3 pct). The most important factors responsible for the performance capability of a pilot are his physical and psychological fitness as well as his abilities, skills, knowledge, and experience, which, however, can be reduced by external disturbances and by a greatly increased workload. It is believed that some of the most recent advances in the cockpit avionics have not been completely adapted to the needs of the human operator. I.S.

A86-29931#
HUMAN PERFORMANCE ASPECTS OF ACCIDENT INVESTIGATION
J. A. MCINTYRE and R. B. STONE (Air Line Pilots Association, International, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 691-695.

The two principal methods used to evaluate the 'human performance' factors responsible for safe in-flight operations and the specific areas of concern in the application of these methods are discussed. The one method is related to the factors directly tied to performance in the operating envelope, i.e., of training, air traffic control, cockpit resource management, fatigue, and illness. The other method relates to evaluating the phychological profile of the flight crew, i.e., the individual lifestyles, stresses, and personal relationships, which are difficult to link with the general accident proneness. Even in the postaccident investigations, the tendency to focus on easy-to-understand human aberrations may water down the technical and complex overall systems approach needed. As an illustration, investigation findings on two aircraft accidents are presented, together with a discussion of the coverage and its omissions. I.S.

A86-29932#
PROGRESS IN HUMAN PERFORMANCE ACCIDENT INVESTIGATION
C. E. SANDLER (National Transportation Safety Board, Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 705-710. refs

The particulars of transportation accidents, most of them involving aircraft, for which a specific human performance factor was identified by a National Transportation Safety Board investigation, are presented. The examples include fatal accidents caused by marijuana use, the erratic behavior of a pilot previously known to possess autocratic personality, overreliance of a crew on an automated system that had a history of discrepancies, and an instance of improper maintenance, due to a change in procedures, by a conscientious and experienced maintenance crew. The Safety Board recommendations, based on the particular performance factors, are presented. I.S.

A86-30360
PERCEPTUAL 'TRAPS' OF THE VISUAL SYSTEM
R. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: 1985 Summer Computer Simulation Conference, Chicago, IL, July 22-24, 1985, Proceedings . San Diego, CA, Society for Computer Simulation, 1985, p. 732-737. refs

Peculiar operational loops in the human visual system are considered. These loops act as 'traps' in the attempted perception of surrounding real world (or displayed) scenes. These traps belong to three categories, including physical, physiological, and psychological. Attention is given to ambient mode and sensor interactions, visual cue sets, sensory interactions, decisional process flow, motion detection 'interrupts', physical processes, physiological processes, psychological processes, the resolution of eye, the resting point of accommodation, luminance/accommodation relation, the resolution/contrast relation, expectance effects, illusion (learned), and emotion and perception. It is found that many traps of the visual process exist, taking into account psychological, physiological, and physical traps. G.R.

A86-30362
SIMULATOR INSTRUCTOR TASK LOADING - THE TIDE IS TURNING
R. A. GAMACHE (Singer Co., Link Flight Simulation Div., Binghamton, NY) IN: 1985 Summer Computer Simulation Conference, Chicago, IL, July 22-24, 1985, Proceedings . San Diego, CA, Society for Computer Simulation, 1985, p. 744-749.

The designer of the simulator instructional system faces a new challenge each time when he is concerned with a new training requirement. Virtually all simulator instructional systems are composed of three major components, including the console or instructor station, CRT displays, and interactive devices such as keyboards and control panels. The instructor's environment is considered along with aspects of display control and interaction, questions of data display and interaction, task oriented systems, multifunction keyboards, and problems of orchestrating and improvising. It is found that instructional system design is a dynamic and evolutionary process, one that requires the designer to thoroughly analyze the problem, identify the potential solutions, make the selections, and create the design. G.R.

A86-31820* New Mexico State Univ., Las Cruces.
BIGNESS IS IN THE EYE OF THE BEHOLDER
S. N. ROSCOE (New Mexico State University; ILLIANA Aviation Sciences, Las Cruces, NM) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 615-636. refs
(Contract NAS2-9094; F49620-77-C-0117; AF-AFOSR-80-00224)

This report reviews an investigation of judgments of size and distance as required of pilots in flight. The experiments covered a broad spectrum of basic psychophysiological issues involving the measurement of visual accommodation and its correlation with various other dependent variables. Psychophysiological issues investigated included the size-distance invariance hypothesis, the projection of afterimages, the moon illusion, night and empty-field myopia, the dark focus and its so-called Mandelbaum effect, the nature and locus of the accommodative stimulus, the relation between accommodation, retinal size, and perceived size, and possible relationships among accommodative responses, autonomic balance, and personality variables. Author

A86-31821
VISUAL LOBE AREA FOR SINGLE TARGETS ON A COMPETING HOMOGENEOUS BACKGROUND
A. J. COURTNEY and H. S. CHAN (University of Hong Kong, Hong Kong) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 643-652. refs

The binocular visual lobe for a detection task, with a peripherally presented target embedded in a homogeneous competing background, was mapped on eight axes passing through the fixation point. The lobes were very irregular in shape and there were differences between the subjects. The eight-axis area correlated highly with area based on only the horizontal and vertical axes, but the latter area gave no indication of even gross irregularities in lobe shape. Lobe areas for two subjects were exhaustively mapped; resulting boundaries were very irregular and there were regions of insensitivity within the lobe area. It was suggested that lobe shape as well as area is important to visual search. The irregular boundary and areas of insensitivity may partly account for the difficulty experienced by some subjects in locating targets even after repeated scanning. Author

A86-31822* Arizona State Univ., Tempe.
THE RELATION BETWEEN THE TYPE A BEHAVIOR PATTERN, PACING, AND SUBJECTIVE WORKLOAD UNDER SINGLE- AND DUAL-TASK CONDITIONS
D. DAMOS (Arizona State University, Tempe) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 675-680. refs
(Contract NCC2-202)

Twenty Type A and 20 Type B subjects performed two discrete tasks alone and together. Half of the subjects performed paced versions of both tasks; half, unpaced versions. Workload ratings were obtained for all subjects under single- and dual-task conditions using eight bipolar adjective scales. Under single-task conditions there was a significant interaction between behavior pattern and pacing on one of the tasks. This interaction indicated that Type A subjects responded more rapidly under unpaced conditions than did Type B subjects, although there was little difference between the groups under paced conditions. Under dual-task conditions, Type A subjects responded more rapidly than did Type B subjects regardless of pacing. There was one significant interaction between behavior pattern and task on one of the workload scales. Author

A86-31823
THE FUNCTIONAL AGE PROFILE - AN OBJECTIVE DECISION CRITERION FOR THE ASSESSMENT OF PILOT PERFORMANCE CAPACITIES AND CAPABILITIES
R. BRAUNE and C. D. WICKENS (Illinois, University, Urbana) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 681-693. refs
(Contract N00204-82-C-0113)

The initial development of a computer-based information-processing performance battery with aviation-relevant task structures is reported. It is shown that the currently existing prototype is sensitive to individual differences within chronological age groups as well as to age-related changes across different age groups. The utilization of such a test battery for the longitudinal assessment of aviator performance capabilities is discussed. Author

A86-31824
EFFECTS OF SPEECH RATE AND PITCH CONTOUR ON THE PERCEPTION OF SYNTHETIC SPEECH
L. M. SLOWIACZEK and H. C. NUSBAUM (Indiana University, Bloomington) Human Factors (ISSN 0018-7208), vol. 27, Dec. 1985, p. 701-712. refs
(Contract NIH-NS-12179; NIH-NS-07134; F33615-83-K-0501)

The effects of speaking rate, meaning, length of speech, and pitch contour on the perception of synthesized speech were examined with reference to the development of high-quality voice response systems. In the first of the two experiments conducted, the subjects transcribed sentences that were either syntactically correct and meaningful or syntactically correct but semantically anomalous. In the second experiment, the sentences varied in length and syntactic structure. In both experiments, presentation, delivered at the rate of either 150 or 250 words/min, varied from monotone to normally inflected clausal intonation. Accelerating the speaking rate, increasing the sentence length or the syntactic complexity of the sentence, and removing semantic information were all found to significantly worsen the performance of the identification of words in sentences. Removing normal pitch cues had only a minor negative effect. I.S.

A86-32072
THE METRIC OF VISUAL SPACE
M. WAGNER (Franklin and Marshall College, Lancaster, PA) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 6, Dec. 1985, p. 483-495. refs

The geometric properties of visual space in the horizontal plane were measured by four different procedures. Five observers were asked to judge distances, angles, and areas defined by pairs and triplets of stakes, using magnitude estimation, category estimation, mapping, and perceptual matching. All judgements took place outdoors in a broad, open field under full-cue conditions. Stimuli oriented in depth were judged to be half as large as the same stimuli oriented in the frontal plane. Angles facing either directly toward or directly away from the observer were seen as approximately twice as large as those seen on their sides. Four mathematical models for visual space are examined. Both the hyperbolic model of Luneburg (1947) and the spherical model of Reid (1813) fail, each for different reasons. Two other models, however, produce a reasonably complete description of visual space. In the first model, visual space is an affine-transformed version of a Euclidean physical space. In the second model, distances are viewed as vectors that can be broken down into in-depth and frontal components relative to the observer. The in-depth component of this vector is contracted by a constant amount in visual space. Author

A86-32073
IMPROVEMENT IN DIRECTION DISCRIMINATION - NO ROLE FOR EYE MOVEMENTS
W. KOSNIK, J. FIKRE, and R. SEKULER (Northwest University, Evanston, IL) Perception and Psychophysics (ISSN 0031-5117), vol. 38, no. 6, Dec. 1985, p. 554-558. refs
(Contract AF-AFOSR-80-0246)

Practice improves observers' ability to discriminate between highly similar directions of motion. In an effort to clarify the basis for this improvement, an observer's eye movements were recorded while he made direction discriminations. It is found that the observer did not need to track the moving target in order to learn the discrimination. Both at the beginning and at the end of training the observer's eye movements more closely resembled movements made while fixating a stationary target, and did not at all resemble movements made while intentionally tracking the stimulus. These results suggest that the learned discrimination of the direction of moving targets is perceptual in nature and does not depend on the learning of a sensorimotor response. Author

A86-32523
THE METHODOLOGY AND TECHNIQUES USED IN ANALYSES OF OPERATOR ACTIVITY [METODIKA I TEKHNIKA ISSLEDOVANII OPERATORSKOI DEIATEL'NOSTI]
V. G. VOLKOV, ED. Moscow, Izdatel'stvo Nauka, 1985, 104 p. In Russian. No individual items are abstracted in this volume.

The methods used in the assessment of the emotional and physiological states as well as the work efficiency of industrial operators are discussed. Papers are presented on the status and characteristics of biosystem modeling, EEG correlates in the process of learning how to drive, experimental studies on the formula of informational theory of emotions, the optimization of operator activity under conditions of monotony, and assessment of the functional state of the human brain at different levels of emotional stress. Consideration is given to the analysis of the effect of corrective methods on the functional state of an organism under conditions of intense visual activity, the oculomotor reaction

in human subjects with functional disorders of the central nervous system, and the dynamics of psychophysiological test indices the period during operator activity. I.S.

A86-33103
MECHANISMS OF HUMAN MOTION PERCEPTION REVEALED BY A NEW CYCLOPEAN ILLUSION
M. SHADLEN and T. CARNEY (California, University, Berkeley) Science (ISSN 0036-8075), vol. 232, April 4, 1986, p. 95-97. refs
(Contract NIH-EY-01175; NIH-EY-05636)

A new cyclopean illusion of motion may bear on neural mechanisms of direction selectivity. Stationary flickering patterns were presented to each eye, and the resulting fused pattern was perceived to be moving. To determine direction of motion, the visual system seems to integrate image components differing by 90 degrees in spatial and temporal phase. On the other hand, image speed seems to be derived from displacement of features over time. A model of neural direction selectivity is discussed in light of these results. Author

N86-23248# Joint Publications Research Service, Arlington, Va.
ELECTRIC SLEEP METHOD OF PREVENTING FATIGUE BUILD-UP IN SAILORS ON EXTENDED CRUISES
Y. STENKO, I. I. VARENIKOV, and V. A. SKRUPSKIY *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-002) p 60-65 8 Jan. 1986 refs Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 5, May 1985 p 42-44
Avail: NTIS HC A06

The effectiveness of drugs and the electric sleep method in the correction of sleep disturbances were compared. It is suggested that the maintenance of normal sleep and the correction of sleep disturbances is kept by prevention of fatigue build up in special forms of work organization in extended sea cruises. It is concluded that electric sleep therapy is the most effective method in the prevention of adverse effects which are the results of the impact of a ship's environmental factors over a period of many months, also includes the cumulative effects of noise. E.A.K.

N86-23261# Joint Publications Research Service, Arlington, Va.
REVIEW OF BOOK ON PRINCIPLES OF AVIATION PSYCHOLOGY Abstract Only
A. MOROZOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 118 12 Mar. 1986 Transl. into ENGLISH from Vozdushnyy Transport (Moscow, USSR), 17 Dec. 1985 p 2
Avail: NTIS HC A07/MF A01

Aviation psychology substantiates interrelated principles of occupational screening, the structure of in-flight work, and flight capabilities which are connected with the instruction and training of future pilots is discussed. Psychological features of flight duty, problems of flight capabilities, occupational screening, the formation and maintenance of flight skills, the role of the personal factor in ensuring the quality of flights, the instruction and training of flight personnel, are examined. Recommendations for the use of psychological data to heighten flight safety are formulated. E.A.K.

N86-23278# Defence Research Information Centre, Orpington (England).
PSYCHOLOGICAL SELECTION OF PERSONNEL FOR EMPLOYMENT IN THE ANTARTIC
L. CROCQ, J. RIVOLIER, and G. CAZES Mar. 1985 21 p Transl. into ENGLISH from Medecine et Armees vol. 1, no. 7, 1973
(DRIC-T-7449; BR95294) Avail: NTIS HC A02/MF A01

Selection methods and methods of behavior monitoring of subjects wintering in Antarctic bases are described. The psychological selection aims to predict the adaptability of the subject to the extreme environment. Procedures for carrying out objective studies in the field of individual and collective phenomena of maladjustment, and the factors which determine or promote them are discussed. Author (ESA)

N86-23279# Harvard Univ., Cambridge, Mass.
VISUAL HEMISPHERIC SPECIALIZATION: A COMPUTATIONAL THEORY Technical Report, 1 Apr. - 31 Oct. 1985
S. M. KOSSLYN 31 Oct. 1985 82 p
(Contract N00014-85-K-0291)
(AD-A161296; TR-7) Avail: NTIS HC A05/MF A01 CSCL 12A

Visual recognition, navigation, tracking and imagery are deposited to involve some of the same types of representations and processes. The first part of this paper develops a theory of some of the shared types of representations and processing modules. This theory is developed in light of computational, neuroanatomical, neurophysiological, and behavioral considerations. The second part of the paper develops a mechanism for the development of lateralization of visual function in the brain. Tnis theory leads to predictions about the lateralization of the putative processing modules. The third part of the paper examines critical tests of these predictions, and reviews relevant empirical findings in the literature. Author (GRA)

N86-23280# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
REPORT FROM A BEHAVIORAL SCIENCE STUDY GRIP TO AUSTRALIA, 23 AUG. - 10 SEP. 1985
G. LARSSON Oct. 1985 12 p refs In SWEDISH; ENGLISH summary
(FOA-C-50027-H3; ISSN-0347-7665) Avail: NTIS HC A02/MF A01

Mental stimulation and means to overcome stress are discussed. Practical techniques and measuring instruments for mental stimulation are commented on. A positive correlation between arousal level and performance, and negative correlation for anxiety and performance are considered. As both exist in variable proportions in practice, the total performance may be represented as an inverted U-curve. Decision making under stress conditions is analyzed. Author (ESA)

N86-24214# Massachusetts Inst. of Tech., Cambridge. Lab. for Information and Decision.
A METHODOLOGY FOR THE ANALYSIS AND DESIGN OF HUMAN INFORMATION PROCESSING ORGANIZATIONS Ph.D. Thesis
K. L. BOETTCHER Sep. 1985 199 p
(Contract N00014-77-C-0532; N00014-84-K-0519)
(AD-A162083; LIDS-TH-1501) Avail: NTIS HC A09/MF A01 CSCL 05J

The design of human organizations in which members perform routine tasks under the pressure of time is considered, particularly the problem of where and how in the design process to take into account human behavior and limitations. A three-phase design approach is suggested. In the first phase, the impact of human characteristics is neglected and attention is focused on aspects of organization structure that are external to individual members. In the second phase, implementations for these decision rules are devised and models of actual human behavior and induced workload for the tasks established for each member are developed. The descriptions are determined as a function of parameters that relate to features of the task set-up and to the options provided to the member for accomplishing his task. A final design phase places these parameters for best organization performance and in view of the workload limitations of individual members. The result is an organization design. The three-phase approach has been formalized as a multi-step methodology. Discussion and illustration is given for each design step. In addition, the methodology is exercised on a specific problem and the resulting organization design has been built. Operation of the organization has been tested under several conditions and experimentally observed results match those predicted for the design, which in turn supports the validity of the design approach. GRA

N86-24215# Navy Personnel Research and Development Center, San Diego, Calif.
DEVELOPMENT OF A COMPUTER-MANAGED READINESS ASSESSMENT SYSTEM Final Report, Jul. 1982 - Sep. 1984
W. F. THODE and P. G. BULETZA Dec. 1985 55 p (AD-A162931; NPRDC-TR-86-8) Avail: NTIS HC A04/MF A01 CSCL 05I

Readiness of operational units, especially Fleet Air Reconnaissance Squadron TWO (VQ-2), is difficult to assess, particularly during operational cycles when the units are fulfilling their missions. This effort was conducted to develop a readiness training assessment system for VQ-2 to provide accurate, timely, and efficient assessments of the operational readiness of aircrew personnel while maintaining the highest possible state of readiness to perform the squadron's mission. The readiness training system for maintaining readiness and training data for VQ-2 aircrew personnel consists of: (1) a matrix for the EP-3E and the EA-3B aircraft of all the events that affect the readiness of the personnel assigned to the 10 crew positions in the EP-3E and the 5 crew positions in the EA-3B for each of the four VQ-2 mission area; (2) a computer-managed system to enter, process, store, and produce the readiness training manual that contains all VQ-2's references on training and readiness. Author (GRA)

N86-24546*# Lambuth Coll., Jackson, Tenn. Dept. of Physics, Mathematics and Computer Science.
A PRELIMINARY STUDY OF FLAT-PANEL DISPLAYS
K. E. YANCEY *In* NASA. Marshall Space Flight Center Research Reports: 1985 NASA/ASEE Summer Faculty Fellowship Program 16 p Jan. 1986 refs
Avail: NTIS HC A99/MF E04 CSCL 09C

Six display technologies that might be of future value in a spacelab workstation are discussed. Some have been developed to the point where they could be used as a computer display while others have not. The display technologies studied are electroluminescents, light-emitting didodes, gas plasma, liquid crystal, electrochromic, and electrophoretic. An explanation of each mechanism is provided along with the state-of-the-art development. Author

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-29852#
LEVELS OF HELICOPTER CONTROL FORCE INPUTS DURING IN-FLIGHT EMERGENCY CONDITIONS AS A FUNCTION OF AVIATOR EXPERIENCE
A. W. SCHOPPER and J. H. WELLS (U.S. Army, Aeromedical Research Laboratory, Fort Rucker, AL) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 1-23. refs

Twelve helicopter pilots flew six normal and six simulated emergency (hydraulics off) condition approaches and landings in a U.S. Army utility helicopter to document the magnitude of force inputs required for emergency operations; the pilots differed widely in number of hours previously flown, in order to determine the effect of pilot experience. Cyclic, collective, and pedal controls were strain gage-instrumented, and attention was given to the outputs recorded during the last 60 sec of flight prior to each touchdown. Analyses of variance undertaken on the means of the forces recorded during successive 5-sec intervals revealed significant differences in the magnitude of the forces applied as a function of hydraulic system condition and time-to-touchdown. Significant interactions with pilot experience are noted. O.C.

A86-29854*# South Dakota Univ., Vermillion.
PILOT USAGE OF DECOUPLED FLIGHT PATH AND PITCH CONTROLS
J. BERKHOUT, R. OSGOOD (South Dakota, University, Vermillion), and D. BERRY (NASA, Flight Research Center, Edwards, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 39-46.

Data from decoupled flight maneuvers have been collected and analyzed for four AFTI-F-16 pilots operating this aircraft's highly augmented fly-by-wire control system, in order to obtain spectral density, cross spectra, and Bode amplitude data, as well as coherences and phase angles for the two longitudinal axis control functions of each of 50 20-sec epochs. The analysis of each epoch yielded five distinct plotted parameters for the left hand twist grip and right hand sidestick controller output time series. These two control devices allow the left hand to generate vertical translation, direct lift, or pitch-pointing commands that are decoupled from those of the right hand. Attention is given to the control patterns obtained for decoupled normal flight, air-to-air gun engagement decoupled maneuvering, and decoupled air-to-surface bombing run maneuvering. O.C.

A86-29856#
COCKPIT INFORMATION REQUIREMENTS ANALYSIS - A MISSION ORIENTATION
D. D. RILEY (Essex Corp., Warminster, PA) and W. A. BREITMAIER (U.S. Navy, Naval Air Development Center, Warminster, PA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 55-61. refs

A methodology has been developed to derive, on the basis of mission needs, the cockpit information requirements of A-6F and V-22 naval aircraft. After determining a representative mission scenario, the mission is broken down into segments and subjected to a function analysis. Functions are then allocated to either human operator or machine control, and cockpit task requirements for each mission segment are derived together with the cockpit information presentation capabilities necessary for operator performance of each task item. Operator task responsibilities are then assigned according to crew position or function for each mission segment. O.C.

A86-29857#
COCKPIT DESIGN AND EVALUATION DATA BASES
V. J. GAWRON (Calspan Corp., Buffalo, NY) and T. J. QUINN (McDonnell Douglas Corp., St. Louis, MO) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 63-68.
(Contract F33615-84-C-0500)

Three computerized data bases have been developed as part of a cockpit design program in order to advise designers as to the availability, source, and requirements of existing cockpit design and evaluation aids. The three data bases give attention to mission models, human performance models, and simulation utilities. Each data base includes information that directly affects design tool use and selection. The mission models encompass such military types as close air support, interdiction, counterair, and defense suppression, as well as environmental conditions, electronic conditions, and mission segments. O.C.

A86-29858*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COGNITIVE NETWORK ORGANIZATION AND COCKPIT AUTOMATION
R. J. ROSKE-HOFSTRAND (NASA, Ames Research Center, Moffett Field, CA; New Mexico State University, Las Cruces) and K. R. PAAP (IBM Santa Teresa Laboratories, San Jose, CA; New Mexico State University, Las Cruces) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 71-78.

Attention is given to a technique for the derivation of pilot cognitive networks from empirical data, which has been successfully used to guide the redesign of the Control Display Unit that serves as the primary interface of the complex flight management system being developed by NASA's Advanced Concepts Flight Simulator program. The 'pathfinder' algorithm of Schvaneveldt et al. (1985) is used to obtain the conceptual organization of four pilots by generating a family of link-weighted networks from a set of psychological distance data derived through similarity ratings. The degree of conceptual agreement between pilots is assessed, and the means of translating a cognitive network into a menu structure are noted. O.C.

A86-29859#
A COMPARISON OF VOICE AND KEYBOARD DATA ENTRY FOR A HELICOPTER NAVIGATION SYSTEM
K. A. CHRIST and F. J. MALKIN (U.S. Army, Human Engineering Laboratory, Aberdeen Proving Ground, MD) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 79-86.

The entering of helicopter navigation data by voice command instead of keyboard punching promises to ease the visual and manual workloads currently experienced by US Army helicopter pilots when flying below treetop level to avoid detection. A comparative evaluation is made of voice and keyboard methods in the case of a Doppler navigation set furnishing worldwide navigation data in universal transverse Mercator coordinates, while the helicopter simulator is operating in level flight and in terrain-following flight. Speed of data entry is found to be greater overall with the keyboard than with the voice, although neither method disrupted flight performance. O.C.

A86-29860*# Psycho-Linguistic Research Associates, Menlo Park, Calif.
SPEECH VARIABILITY EFFECTS ON RECOGNITION ACCURACY ASSOCIATED WITH CONCURRENT TASK PERFORMANCE BY PILOTS
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 87-102. refs
(Contract NAS2-11431)

In the present study of the responses of pairs of pilots to aircraft warning classification tasks using an isolated word, speaker-dependent speech recognition system, the induced stress was manipulated by means of different scoring procedures for the classification task and by the inclusion of a competitive manual control task. Both speech patterns and recognition accuracy were analyzed, and recognition errors were recorded by type for an isolated word speaker-dependent system and by an offline technique for a connected word speaker-dependent system. While errors increased with task loading for the isolated word system, there was no such effect for task loading in the case of the connected word system. O.C.

A86-29861#
DEVELOPMENT OF A COMPREHENSIVE VOICE MESSAGE VOCABULARY FOR TACTICAL AIRCRAFT
D. J. FOLDS (Georgia Institute of Technology, Atlanta) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 103-110. refs
(Contract F33615-83-D-0601)

Synthetic speech messages are currently implemented in some tactical aircraft and speech message systems have been proposed for others. The purpose of the present research was to obtain the judgments of tactical pilots and researchers in the field concerning the best uses of voice messages in near-term tactical aircraft, and to integrate those judgments into a comprehensive message ensemble for tactical aircraft. Results from the pilot survey are presented and unresolved issues are discussed. Author

A86-29866#
SELECTING COLOR CODES FOR A COMPUTER-GENERATED TOPOGRAPHIC MAP BASED ON PERCEPTION EXPERIMENTS AND FUNCTIONAL REQUIREMENTS
A. SPIKER, S. P. ROGERS, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 151-158. refs

The development of computer-generated topographic displays (CGTDs) for Army helicopter and other tactical vehicles provides a number of advantages related to terrain-correlation navigation, mission planning, and enroute navigation. A selection of suitable color code displays based on a study of human factors and functional requirements, can be a great help in an efficient implementation of functions to be provided by the CGTD. Attention is given to the digital map system, the primary functional requirements with respect to color and symbology, color naming studies involving the employment of 40 subjects in four experiments, map search studies with 20 subjects, and color set recommendations. It is concluded that depending on the distribution of chromaticities and luminances in the color set, color contrast, brightness contrast, and Gaussian spread may either hinder or help performance. G.R.

A86-29869#
LUMINANCE CONTRAST REQUIREMENTS FOR LEGIBILITY OF SYMBOLS ON COMPUTER-GENERATED MAP DISPLAYS IN AIRCRAFT COCKPITS
S. P. ROGERS, A. SPIKER, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 175-182. refs
(Contract DAAK80-81-C-0089)

Difficulties regarding the translation of research findings into design recommendations in the case of symbol luminance have been related to inconsistent results. The present paper is concerned with studies which have been conducted with the aim to avoid the shortcomings of earlier investigations. In the described experiments, luminance and luminance contrast effects in low, moderate, and high ambient illumination environments are examined. The obtained results confirm and extend previous findings in the visual adaptation area. Average response time decreased with increases in contrast ratio, decreases in adaptation luminance, and increases in display background luminance. The result of the current investigation underlines the importance of basing cockpit display design decisions on quantitative perceptual data. G.R.

A86-29871#
POTENTIAL CONTROLLER ERROR MODES IN AUTOMATED EN ROUTE ATC (AERA)
J. B. MCKINLEY and R. J. JAGO (Systems Control Technology, Inc., Washington, DC) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 189-197. Research sponsored by the Martin Marietta Corp. refs

A snapshot of an ongoing human factors evaluation for the FAA's Advanced Automation System program is presented. In particular, the anticipated Automated En Route Air Traffic Control (AERA) controller's functions and tasks are described. Potential error modes that may be attributable to system error causes such as attention, judgment, and communication are identified. Finally, AERA controller training implications are discussed and primary skill requirements are described for each of the AERA control processes. C.D.

A86-29873#
COPING WITH AUTOMATION - AN AIRLINE VIEW
R. G. BULEY (Republic Airlines, Inc., Minneapolis, MN) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 207-214.

The formation of a systematic approach to aircraft automation is examined. The need to have aircraft manufacturers develop a man-machine interface designed to airline specifications is discussed. The role of humans in present and future systems is described. Proper management of resources which extracts the maximum benefits from human and automated resources is required for the airlines to successfully utilize automation. I.F.

A86-29874*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CAN PILOTS TIME-SHARE BETTER THAN NON-PILOTS?
P. S. TSANG (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 215-222. refs

The time-sharing ability of 12 male pilots and 12 male college students ranging in age from 18-36 are evaluated and compared. The subjects performed five pairs of dual tasks with varying degrees of structural similarity; the test procedures are described. The time-sharing efficiency and resource allocation optimality of the subjects are analyzed. The data reveal that the pilots and students display similar time-sharing performance; the degree of time-sharing efficiency decreases and resource allocation optimality increases with an increasing degree of structural similarity between the time-shared tasks. I.F.

A86-29875*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CAUSES OF DISSOCIATION BETWEEN SUBJECTIVE WORKLOAD MEASURES AND PERFORMANCE - CAVEATS FOR THE USE OF SUBJECTIVE ASSESSMENTS
M. A. VIDULICH (NASA, Ames Research Center, Moffett Field, CA) and C. D. WICKENS (Illinois, University, Champaign) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 223-230. refs
(Contract N00014-79-C-0658)

Dissociations between subjective workload assessments and performance were investigated. The difficulty of a Sternberg memory search task was manipulated by varying stimulus presentation rate, stimulus discernibility, value of good performance, and automaticity of performance. All Sternberg task conditions were performed both alone and concurrently with a tracking task. Bipolar subjective workload assessments were collected. Dissociations between workload and performance were found related to automaticity, presentation rate, and motivation level. The results were interpreted as supporting the hypothesis that the specific cognitive processes responsible for subjective assessments can differ from those responsible for performance. The potential contamination these dissociations could inflict on operational workload assessments is discussed. Author

A86-29876#
RELATIVE CONTRIBUTIONS OF SWAT DIMENSIONS TO OVERALL SUBJECTIVE WORKLOAD RATINGS
S. S. POTTER and W. H. ACTON (Systems Research Laboratories, Inc., Dayton, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 231-238. refs

The present study investigated several aspects of the Subjective Workload Assessment Technique (SWAT) using a recall task designed to place demands upon short term memory processing. Reaction time data, SWAT ratings, and ratings on overall task difficulty proved sensitive to demand manipulations, and the correlation between the two subjective scales was significant. The results also indicated differential sensitivity between the three SWAT subscales, which supports the assumption that the three dimensions in SWAT represent separate dimensions of subjective load. This finding has significant implications for the application of SWAT in operational settings. System designers are not only concerned with the overall degree of workload imposed by a system, but also need information about the specific aspects which are responsible for producing the high levels of workload. Author

A86-29877*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TECHNIQUES OF SUBJECTIVE WORKLOAD ASSESSMENT - A COMPARISON OF TWO METHODOLOGIES
M. A. VIDULICH and P. S. TSANG (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 239-246. refs

With increasing complexity of systems, evaluation techniques based on close examination of an operator's performance become more and more difficult to perform, and it is much easier to base on evaluation of a workload on the opinion of the operator involved in performing the task. The present paper has the objective to compare two of the general subjective workload assessment techniques which have been developed. One of these techniques, the Subjective Workload Assessment Technique (SWAT), has been developed primarily at the USAF Aerospace Medical Research Laboratory for use in cockpit environments. The second technique, the NASA weighted-bipolar technique, is a development tool to examine the underlying relationships among many factors. One of the two goals of the study is concerned with the general validity of subjective workload assessments, while, according to the second goal, any particular strengths or weaknesses with respect to either of the two techniques are to be observed. It is concluded that both techniques appear to be worthwhile. G.R.

A86-29878#
SUBJECTIVE ASSESSMENT OF PILOT WORKLOAD IN THE ADVANCED FIGHTER COCKPIT
S. D. DETRO (BDM Corp., Brookville, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 247-254.

In connection with the development of advanced cockpit design concepts, it is vital that the workload for the pilot in the context of human-machine interactions does not exceed inherent human limitations. On the basis of cost considerations, a validation of cockpit concepts at an early design stage is crucial. Two procedural variants of the Subjective Workload Assessment Technique (SWAT) have been developed for the evaluation of tentative cockpit designs. In a combination of the SWAT technique and another subjective technique, called Ground Attack Tactics Survey (GATS), quantitative data can be effectively derived from structured interviews with 'expert operators' of similar systems. The considered techniques were used to explore the workload implications of advanced crew system control and display concepts for an advanced fighter cockpit when prototype aircrew protection

equipment (Chemical, Biological, and Radiological /CBR/) was also in use. G.R.

A86-29880*# BITS, Inc., West Layfayette, Ind.
MEASURING PILOT WORKLOAD IN A MOTION BASE TRAINER - A COMPARISON OF FOUR TECHNIQUES
M. R. BORTOLUSSI, B. H. KANTOWITZ (BITS, Inc., West Lafayette, IN), and S. G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 263-270. refs
(Contract NCC2-228)

Various techniques have been developed to predict and measure pilot workload. This simulation was conducted in order to compare four widely used methods: A visual two- and four-choice reaction time task, time production, retrospective multi-dimensional subjective ratings and in-flight verbal workload estimates. Two scenarios with different levels of difficulty determined by preliminary research were designed to test these techniques. The insertion of the secondary tasks did not significantly affect flight performance. All four techniques were able to distinguish among levels of scenario complexity. In addition, the three secondary tasks and workload ratings obtained in-flight were generally able to distinguish among levels of difficulty for different segments within the scenarios. Author

A86-29881#
TIME-SHARING REVISED - TEST OF A COMPONENTIAL MODEL FOR THE ASSESSMENT OF INDIVIDUAL DIFFERENCES
R. BRAUNE and C. D. WICKENS (Illinois, University, Savoy) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 271-278. refs
(Contract N00204-82-C-0113)

In many systems, taking into account also nuclear power plants and modern-day aircraft, the human operator is required to control and/or monitor several tsks in parallel. Any differences in 'time-sharing efficiency' during the operation of some systems, such as those in a current fighter aircraft, can be crucial for the success. For this reason, it appears important to have information about individual differences occurring in people with respect to their ability for time-sharing performance. A componential model of time-sharing performance was, therefore, tested. It was found that the notion of a general time-sharing ability could not be rejected due to the high intercorrelations between the extracted factors. Preliminary results of a second-order factor analysis suggest the existence of a general time-sharing factor. This factor appears to represent a bipolar continuum related to attention switching and parallel processing of heterogeneous dynamics. G.R.

A86-29918#
AN INVESTIGATION REGARDING THE USE OF A DYNAMIC SEAT-PAN DISPLAY FOR TRAINING AND AS A DEVICE FOR COMMUNICATING ROLL-AXIS MOTION INFORMATION
E. A. MARTIN (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 591-600. refs

This paper describes a research program conducted to determine the feasibility of providing useful angular onset-motion information via a broad-area tactual seat-pan display. The experiment was designed to permit the evaluation of the utility of the display as a training device as well as its efficacy for imparting motion information. The results indicate that - with proper attention given the drive law the tactual display can elicit both performance and control behavior indistinguishable from that observed in a whole-body motion environment. Unfortunately, the training transfer results were not so encouraging. These indicated that the seat-pan display as used in this study was not adequate for training naive subjects to properly interpret and use the motion information available in a whole-body motion environment. Author

A86-29920#
TACTUAL CUING CAN PRODUCE BETTER PERFORMANCE THAN VISUAL CUING
M. K. SNELL (Systems Research Laboratories, Inc., Dayton, OH), J. M. FLACH (Illinois, University, Urbana), G. R. MCMILLAN, and R. WARREN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Symposium on Aviation Psychology, 3rd, Columbus, OH, April 22-25, 1985, Proceedings . Columbus, OH, Ohio State University, 1985, p. 609-616. refs

Three experiments were conducted to investigate the relative utility of g-seat tactual motion cuing (cuing imparted by a moving seat pan) and visual motion cuing (cuing imparted by a schematic attitude indicator) to subjects performing a compensatory roll-axis tracking task. The studies compared tracking performances with three motion cuing conditions: g-seat plus visual, g-seat alone, and visual alone. The lowest error scores occurred when the g-seat plus visual cuing conditions were used. When used separately, the g-seat produced significantly lower error scores than the visual condition. A whole-body motion plus visual condition was included for comparison. Author

A86-30149
ENVIRONMENTAL CONSIDERATIONS AND WASTE PLANNING ON THE LUNAR SURFACE
R. BRIGGS and A. SACCO, JR. (Worcester Polytechnic Institute, MA) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 423-430. refs

Developments related to the establishment and maintenance of a lunar facility are examined, taking into account arising waste and environmental problems. Processes to obtain oxygen on the moon from lunar ilmenite for a transport to low earth orbit (LEO) are discussed along with questions of life support on the moon, the utilization of nuclear power for lunar needs, the transport of man and materials to low lunar orbit (LLO), and transportation between LLO and LEO. Waste and environmental problems are partly related to the desirability to preserve the present perfect environmental conditions for an astronomical observation post on the far side of the moon. In addition, it will be necessary to comply with an international treaty which stipulates, among other things, that harmful contamination of the moon is to be avoided. A summary of environmental considerations arising from lunar operations is presented. G.R.

A86-30164* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE EVOLUTION OF CELSS FOR LUNAR BASES
R. D. MACELROY, H. P. KLEIN (NASA, Ames Research Center, Moffett Field, CA), and M. M. AVERNER (New Hampshire, University, Durham) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 623-633. refs

A bioregenerative life support system designed to address the fundamental requirements of a functioning independent lunar base is presented in full. Issues to be discussed are associated with CELSS weight, volume and cost of operation. The fundamental CELSS component is a small, highly automated module containing plants which photosynthesize and provide the crew with food, water and oxygen. Hydrogen, nitrogen and carbon dioxide will be initially brought in from earth, recycled and their waste products conserved. As the insufficiency of buffers necessitates stringent cybernetic control, a stable state will be maintained by computer control. Through genetic engineering and carbon dioxide, temperature, and nutrient manipulation, plant productivity can be increased, while the area necessary for growth and illumination energy decreased. In addition, photosynthetic efficiency can be enhanced through lamp design, fiber optics and the use of appropriate wavelengths. Crop maintenance will be performed by robotics, as a means of preventing plant ailments. K.K.

A86-30167* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
IMPLEMENTING SUPERCRITICAL WATER OXIDATION TECHNOLOGY IN A LUNAR BASE ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM
M. MEYER SEDEJ (NASA, Johnson Space Center, Houston, TX) IN: Lunar bases and space activities of the 21st century . Houston, TX, Lunar and Planetary Institute, 1985, p. 653-661. refs

A supercritical water oxidation system (SCWOS) offers several advantages for a lunar base environmental control/life support system (ECLSS) compared to an ECLSS based on Space Station technology. In supercritically heated water (630 K, 250 atm) organic materials mix freely with oxygen and undergo complete combustion. Inorganic salts lose solubility and precipitate out. Implementation of SCWOS can make an ECLSS more efficient and reliable by elimination of several subsystems and by reduction in potential losses of life support consumables. More complete closure of the total system reduces resupply requirements from the earth, a crucial cost item in maintaining a lunar base. Author

A86-32315
EFFECTS OF ADAPTATION AND DISPLAY LUMINANCE ON CRT SYMBOL RECOGNITION TIME
A. SPIKER, S. P. ROGERS, and J. CICINELLI (Anacapa Sciences, Inc., Santa Barbara, CA) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 13-20. refs
(Contract DAAK80-81-C-0089)

The inability of the human visual system to adapt quickly to a wide range of environmental luminances poses a stiff challenge to the design of airborne displays. Using a repeated measures factorial design, the present study investigated the independent and interactive effects of adaptation luminance, contrast ratio, and display background luminance on this 'eye adaptation mismatch' phenomenon. Adaptation luminances ranged from 1 fL to 10,000 fL, with legibility defined as the time required by observers to recognize CRT symbols. Overall, response time increased systematically with increases in adaptation luminance, and decreased with increases in contrast ratio and display background luminance. Additional analyses revealed that contrast ratio and display luminance influence response time multiplicatively, such that quests to maintain large contrast ratios under bright ambient light at the expense of lowered display luminance could exaggerate the mismatch between adaptation luminance and display luminance and thus degrade symbol legibility. Author

A86-32316
MINIMUM COLOUR DIFFERENCES REQUIRED TO RECOGNISE SMALL OBJECTS ON A COLOUR CRT
P. L. PHILLIPS (British Aerospace, PLC, Sowerby Research Centre, Bristol, England) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 21-34. Sponsorship: Ministry of Defence. refs
(Contract MOD RP42-3)

Data were obtained on the eye's sensitivity to irregular objects viewed at small subtense, to extend the current standards and methods available for both military and general use for evaluating the color and other displays. Computer-controlled CRT was employed on a variety of background and object colorings, to measure the threshold color difference that an observer requires between an object and background, so that he can discriminate a variety of similar objects. The results are presented in the CIE international colorimetric system. It was shown that larger color differences are required for object recognition than those assumed from conventional color discrimination data. A simple relationship to account for object size and background color is suggested to aid in visual performance assessments and mathematical modeling. I.S.

A86-32317
THE RASTERED EYE - VISION IN TELEVISION
R. E. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: Advances in display technology V; Proceedings of the Meeting, Los Angeles, CA, January 24, 25, 1985 . Bellingham, WA, SPIE - The International Society for Optical Engineering, 1985, p. 36-42.

Limiting resolution criteria for detection, orientation, recognition and identification of objects in the visual scene or display have been developed using static high contrast targets. Misconception or misapplication of these criteria to television systems has led to underspecification or underdesign of visual display systems by a factor of 3 to 4 times. Limiting resolution criteria for rastered visual display systems are presented, together with other visual parameter effects. These criteria are used to develop 'standard' sets of parameters for the specification of raster visual display systems. Author

A86-32451* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WINDOW OF VISIBILITY - A PSYCHOPHYSICAL THEORY OF FIDELITY IN TIME-SAMPLED VISUAL MOTION DISPLAYS
A. B. WATSON, A. J. AHUMADA, JR., and J. E. FARRELL (NASA, Ames Research Center, Moffett Field, CA) Optical Society of America, Journal, A: Optics and Image Science (ISSN 0740-3232), vol. 3, March 1986, p. 300-307. refs

A film of an object in motion presents on the screen a sequence of static views, while the human observer sees the object moving smoothly across the screen. Questions related to the perceptual identity of continuous and stroboscopic displays are examined. Time-sampled moving images are considered along with the contrast distribution of continuous motion, the contrast distribution of stroboscopic motion, the frequency spectrum of continuous motion, the frequency spectrum of stroboscopic motion, the approximation of the limits of human visual sensitivity to spatial and temporal frequencies by a window of visibility, the critical sampling frequency, the contrast distribution of staircase motion and the frequency spectrum of this motion, and the spatial dependence of the critical sampling frequency. Attention is given to apparent motion, models of motion, image recording, and computer-generated imagery. G.R.

A86-33183* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ROBOTS AS MAN-EXTENSION SYSTEMS IN SPACE
A. K. BEJCZY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2411-2416. NASA-supported research. refs

The main topic of the paper is sensing and computer based automation and man-machine interface devices and techniques which permit task-level and 'intelligent' two-way communication between human operator and remote robot in earth orbit. General considerations are presented on control and information problems in teleoperation and on the characteristics of earth orbital teleoperation. Specific control and information display devices and techniques are discussed and exemplified with development results obtained at the Jet Propulsion Laboratory (JPL) in recent years. Author

A86-33184
INTERACTION BETWEEN CONTROLLING, PLANNING, AND FAULT MANAGING IN COMPLEX MAN-MACHINE SYSTEMS
G. JOHANNSEN (Kassel, Gesamthochschule, West Germany) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2541-2545. refs

The three main task categories in man-machine systems are controlling, planning, and fault managing which are briefly explained in the paper. Their interaction is illustrated schematically with a block diagram and further outlined using Rasmussen's cognitive levels of behaviour. Two paradigms, namely car driving and aircraft piloting, exemplify the nature of the interaction in more detail, partially based on experimental results. The state-of-the-art in

modelling these task categories and their interaction is discussed with an emphasis on qualitative vs. quantitative models using control theory, artificial intelligence techniques, and fuzzy set theory. Model-based support and expert systems are mentioned as an important future application. Author

A86-33186
MULTI-COMPONENT CHARACTERIZATION OF THE HUMAN OPERATOR'S CONTROL OUTPUT
T. YOSHIDA (Matsue Technical College, Japan) and H. TAMURA (Osaka University, Toyonaka, Japan) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2603-2608. refs

In this paper the human control output in the manual control system is studied under the assumption that it consists of three components. The first is a input component which assumed to be a continuous function of time generated by the input model in operator's brain. The second is a system component which takes place, depending on the current state of the error. The third is the psychophysical noise of the operator. The existence of each component is experimentally ascertained. Next, the control output is subdivided into two phases based on remnant, and the roles of the input and the system component are clarified. These results support that the control logic is reflected on remnant and that the proposed conceptional model is valid. Author

A86-33187
A UNIFYING APPROACH TO HUMAN PILOT MODELLING
R. A. HESS (California, University, Davis) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2609-2613. refs

The data base supporting models of the human pilot participating in well defined single-axis tracking tasks can be considered essentially complete as regards the effects of aircraft dynamics and disturbance characteristics. Despite this fact, certain fundamental and interesting questions have only recently been addressed or remain unanswered. Among these are the following: (1) By what mechanism does the human pilot generate the dynamic equalization required in tracking tasks? (2) How might the human utilize an 'internal model' of the environment in these tasks? (3) What causes nonlinear pilot behavior when controlling higher-order dynamics? (4) How do manipulator characteristics effect human pilot dynamics and performance? (5) How does the human organize his perceptions in pursuit as opposed to compensatory tracking? (6) How does the human quantify his subjective impressions of task difficulty or handling qualities? With these and related issues in mind, a 'structural model' of the human pilot is discussed. The model is shown to be descriptive rather than predictive in nature and is shown to have its basis in an hypothesized feedback structure involving the human neuromuscular system. Selecting pertinent examples from experimental results reported in the literature, the questions just raised are discussed and the potential of the structural model to answer them in a unified manner is demonstrated. Author

A86-33188
EXPERT COMPUTER AIDED DECISION IN SUPERVISORY CONTROL
A. BISSERET (Institut National de Recherche en Informatique et en Automatique, Le Chesnay, France) IN: A bridge between control science and technology. Volume 5 . Oxford and New York, Pergamon Press, 1985, p. 2621-2626. refs

Supervisory control is changing from surveillance on large classical control panels to a surveillance on computer displays with the use of man-computer dialogues. The displayed information of course can be sophisticated, and interesting efforts currently pursued in this direction are presented. But moreover it should become possible to have the computer participate directly to the decision activities. The concept of expert system might be promising but only for already expert activity. This paper insists on the non-expert but necessary problem solving activity of the supervisors facing unforeseen situations. The development of research towards computer aid specific to this activity is stressed. Examples of recent advances in cognitive psychology and artificial intelligence are suggested as directions for this development. Author

A86-33322
ELECTRONIC DISPLAYS [ELEKTRONNYE PRIBORY DLIA OTOBRAZHENIIA INFORMATSII]
IU. A. BYSTROV, I. I. LITVAK, and G. M. PERSIANOV Moscow, Izdatel'stvo Radio i Sviaz', 1985, 240 p. In Russian. refs

The design and principles of operation of electronic displays are reviewed, as are engineering and psychological problems associated with the use of such displays in ergodic systems. In particular, attention is given to the classification of electronic displays, their principal parameters, control systems for electronic displays, and applications. The types of displays discussed include cathode-ray tube displays, vacuum incandescent and luminescent displays, liquid-crystal displays, electrochromic displays, graphic fluorescent indicator panels, and laser displays. V.L.

A86-33324
INFORMATION DISPLAY COMPLEXES [KOMPLEKSY SREDSTV OTOBRAZHENIIA INFORMATSII]
V. N. REVENKO and V. M. SEGAL Moscow, Izdatel'stvo Radio i Sviaz', 1985, 217 p. In Russian. refs

An approach to the design and development of displays for automatic control systems operating in real time is presented. A classification of display systems is proposed, and interfacing of displays with the mainframe computer is discussed. An algorithm is proposed for determining the optimal distribution of functions between the hardware and the software of a display. The discussion also covers an analysis and modeling of CRT displays, general and special display software, evaluation of the performance and cost effectiveness of displays, and consideration of the human factor in designing display systems. V.L.

N86-23264# Joint Publications Research Service, Arlington, Va.
OXYGEN-LIBERATING MIXTURES FOR BREATHING APPARATUS Abstract Only
In its USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-004) p 131 12 Mar. 1986 Transl. into ENGLISH from Sovetskaya Belorussiya (Minsk, USSR), 10 Dec. 1985 p 4
Avail: NTIS HC A07/MF A01

Mixtures which are capable at any time of releasing their stored oxygen were prepared. When heated, 100 grams of a substance ground into powder releases more than 40 liters of gas. This is enough to sustain human respiration for several hours in extreme conditions. Such a need may arises in medical practice, in mines, under water, and high in the mountains. The development of these alloys is the result of theoretical and experimental work. Their components are mixtures of salts and inorganic peroxides. E.A.K.

N86-23281# Lawrence Livermore National Lab., Calif.
DESIGN GUIDELINES FOR THE USE OF AUDIO CUES IN COMPUTER INTERFACES
D. A. SUMIKAWA, M. M. BLATTNER, K. I. JOY, and R. M. GREENBERG Jul. 1985 25 p Presented at the 19th Annual Hawaii International Conference on System Sciences, Honolulu, Hawaii, 8 Jan. 1986 Prepared in cooperation with California Univ., Davis, Calif.
(Contract W-7405-ENG-48)
(DE85-015176; UCRL-92925; CONF-860107-1) Avail: NTIS HC A02/MF A01

A logical next step in the evolution of the computer-user interface is the incorporation of sound thereby using our senses of hearing in our communication with the computer. This allows our visual and auditory capacities to work in unison leading to a more effective and efficient interpretation of information received from the computer than by sight alone. In this paper we examine earcons, which are audio cues, used in the computer-user interface to provide information and feedback to the user about computer entities (these include messages and functions, as well as states and labels). The material in this paper is part of a larger study

that recommends guidelines for the design and use of audio cues in the computer-user interface. The complete work examines the disciplines of music, psychology, communication theory, advertising, and psychoacoustics to discover how sound is utilized and analyzed in those areas. The resulting information is organized according to the theory of semiotics, the theory of signs, into the syntax, semantics, and pragmatics of communication by sound. Here we present design guidelines for the syntax of earcons. DOE

N86-24216 Kansas State Univ., Manhattan.
STOCHASTIC MODELS OF MAN-MACHINE SYSTEM EFFECTIVENESS Ph.D. Thesis
K. W. LEE 1985 360 p
Avail: Univ. Microfilms Order No. DA8528018

A human performance reliability model was developed to introduce the human operator effect into the system effectiveness model. The model can predict quantitatively how much the human aspects of the man-machine system contribute to the system unreliability. Mission effectiveness models that provide a realistic measurement of system effectiveness are presented. It depicts interrelationships between the components of the mission system and shows a way to properly integrate the human operator into mission effectiveness. For situations in which there are too many computational difficulties in developing the models, the simulation approach is more practical than the analytical approach. To demonstrate the sensitivity of the probabilistic assumptions for the system variables to the mission effectiveness, a robustness test is performed. To identify system variables sensitive to mission effectiveness can be obtained by allocating more effort to estimating these variables. The models developed will lead to a more valid effectiveness analysis output and provide a useful tool for consistent system evaluation. Dissert. Abstr.

N86-24217*# Essex Corp., Huntsville, Ala. Space Systems Group.
THE SYSTEM INTEGRATION AND VERIFICATION TESTING OF AN ORBITAL MANEUVERING VEHICLE FOR AN AIR BEARING FLOOR Final Report
N. L. SHIELDS, JR., M. F. MARTIN, K. R. PAULUKAITIS, J. W. HASLAM, JR., and D. E. HENDERSON 22 Feb. 1986 125 p refs
(Contract NAS8-35636)
(NASA-CR-178350; NAS 1.26:178350; H-86-02) Avail: NTIS HC A06/MF A01 CSCL 05H

The teleoperator and Robotics Evaluation Facility (TOREF) is composed of a 4,000 square foot precision air bearing floor, the Teleoperator Motion Base, the Target Motion and Support Simulator, the mock-ups of the Hubble Space Telescope, Multi-mission Modular Spacecraft, and the Orbital Maneuvering Vehicle (OMV). The TOREF and its general capabilities to support the OMV and other remote system simulations; the facility operating procedures and requirements; and the results of generic OMV investigations are summarized. B.G.

N86-24218# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECT OF HEAT AND CHEMICAL PROTECTIVE CLOTHING ON COGNITIVE PERFORMANCE Final Report
B. J. FINE and J. L. KOBRICK Nov 1985 27 p
(AD-A162001; USARIEM-M-4/86) Avail: NTIS HC A03/MF A01 CSCL 06Q

This study examined the effects of heat on the sustained cognitive performance of sedentary soldiers clad in chemical protective clothing, Twenty males trained for 2 weeks on selected military tasks. Then, they performed the tasks for 7-hour periods on 4 successive days in hot (32.8C.,61%rh) and normal (21.1C35%rh) conditions, with and without protective clothing. After 4 to 5 hours in the heat wearing protective clothing, the cognitive performance of the group began to deteriorate markedly. By the end of 7 hrs. of heat, increases in % group error on investigator-paced tasks ranged from 17% to 235 over control conditions. Virtually all of the decrements were due to increases in errors of omission. The productivity of the group on a self-paced task (map plotting) diminished by approximately 40% from control conditions after 6 hrs. in the heat in protective clothing; accuracy of plotting was not markedly affected. GRA

N86-24219# Army Research Inst. of Environmental Medicine, Natick, Mass.
EFFECTIVENESS OF AN AIR-COOLED VEST USING SELECTED AIR TEMPERATURE AND HUMIDITY COMBINATIONS
N. A. PRIMENTAL, H. M. COSIMINI, M. N. SAWKA, and C. B. WENGER Nov. 1985 25 p
(AD-A162026; USARIEM-M5/86) Avail: NTIS HC A02/MF A01 CSCL 06Q

We evaluated the effectiveness of an air-cooled vest in reducing thermal strain when supplied with five different dry bulb (db) and dew point (dp) temperature combinations. The combinations were selected to determine minimal air conditioning requirements for various military vehicles. Four male soldiers attempted twelve, 300-min heat exposures (49 C db, 20 C dp) at metabolic rates of 175 and 315 W. They wore chemical protective clothing over the combat vehicle crewman uniform; on ten of the test days, they also wore the air-cooled vest. Air supplied to the vest ranged from 20-27 C db, 7-18 C dp. Without the vest, endurance times were 118 min (175 W) and 73 min (315 W). Endurance times with the vest were 300 min (175 W) and 242-300 min (315 W). Rectal temperatures, heart rates and sweating rates were reduced dramatically with the air at the lower dry bulb temperature. We conclude that effective combinations of cooled and dehumidified air can be provided on military vehicles to reduce the crewmen's thermal strain, with minimized size and weight penalties. GRA

N86-24220# Naval Postgraduate School, Monterey, Calif.
THE DESIGN OF NATURAL LANGUAGE INTERFACES M.S. Thesis
I. KOTROZOS Sep. 1985 110 p
(AD-A162181) Avail: NTIS HC A06/MF A01 CSCL 05H

One of the possible solutions to the problem of designing effective man-machine interfaces seems to be the use of natural languages. This thesis examines the principles of design of effective man-machine interfaces, the role of natural languages in achieving effective man-machine communication and the implementation issues and techniques for their use as interfaces. GRA

N86-24221# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
AN EXAMINATION OF THE LIFE SUPPORT EQUIPMENT DEVELOPMENT AND ACQUISITION PROCESS M.S. Thesis
J. J. MOYER Sep. 1985 66 p
(AD-A162241; AFIT/GSM/XPX/85S-24) Avail: NTIS HC A04/MF A01 CSCL 15E

The process of life support equipment development and acquisition is examined. This research identified the how the present process works, and the problems of the process. The research was limited to the development and acquisition of life support equipment for tactical aircraft. However, most of the problems and steps of the process are shared by life support equipment programs for other users. The process was determined by referring to applicable regulations and interviewing people involved in the process. Problems were identified during interviews, and by examining the process as a whole. Seven problems are identified, of which five are considered correctable in the current defense acquisition framework. Four of the five problems deal with the management of the acquisition and development process, and combined indicate the lack of an integrated approach. Solutions were developed from suggestions obtained during the interviews and through qualitative analysis of the problems. An integrated solution is proposed in the recommendations. GRA

N86-24222# Naval Postgraduate School, Monterey, Calif.
HUMAN FACTORS ENGINEERING AND OPERABILITY IN THE DESIGN OF ELECTRONIC WARFARE SPACES ABOARD UNITED STATES NAVAL COMBATANTS M.S. Thesis
D. J. BLAUSER, JR. Sep. 1985 118 p
(AD-A162251) Avail: NTIS HC A06/MF A01 CSCL 17D

The purpose of this thesis is to present and discuss a a method of assessing the effectiveness of a work space layout. In addition, this method will provide the framework for pinpointing those areas of layout design where redesign will be most cost effective. The objective is to address inefficiencies in the layout of warfare modules on U.S. Navy combatants. In particular, the Electronic Warfare Module on aircraft carriers is assessed due to the highly time-critical nature of electronic warfare. The method chosen in this thesis is a modification of two techniques of assessment: Integration Analysis and Mission Operability Assessment Technique (MOAT). The portions of these techniques used are Link Analysis, Task Analysis, and Operability Analysis. The application herein concludes that the EW Module layout design on the latest NIMITZ-class aircraft carriers was less than 40% effective in promoting mission accomplishment. GRA

N86-24223# Essex Corp., Westlake Village, Calif. Human Factors and Training Systems Group.
PERSON COMPUTER DIALOGUE: A HUMAN ENGINEERING DATA BASE SUPPLEMENT
B. E. SHAW and M. E. MCCAULEY Jan. 1985 148 p
(Contract F33615-82-C-0513)
(AD-A163074; AFAMRL-TR-85-013) Avail: NTIS HC A07/MF A01 CSCL 09B

This report was prepared as a Human Engineering Data Base Supplement to the Integrated Information for Designers (IPID) Engineering Data Compendium. It was specifically written to aid computer system designers. The body of literature on person-computer dialogue has been gathered and organized into an integrated format. Major topic areas include conceptual comparisons of person-computer dialogue, models for evaluation of dialogue systems, unique considerations of specific user groups, and specific user-system dialogue design considerations. These major areas are subdivided into succinct discussions of highly focused design considerations. Each discussion of design considerations includes a general description, statement of applications, constraints, and key references in addition to the graphic/tabular formatted design guidelines. An extensive bibliography of literature on person-computer dialogue is included. GRA

N86-24527*# Mississippi State Univ., Mississippi State. Dept. of Chemical Engineering.
STANDARDIZATION OF CARBON-PHENOLIC COMPOSITE TEST METHODOLOGY
W. B. HALL *In* NASA. Marshall Space Flight Center Research Reports: 1985 NASA/ASEE Summer Faculty Fellowship Program 27 p Jan. 1986
Avail: NTIS HC A99/MF E04 CSCL 11D

The objective of this study was to evaluate the residual volatiles, filler content, and resin flow test procedures for carbon-phenolic prepreg materials. The residual volatile test procedure was rewritten with tighter procedure control which was then evaluated by round robin testing by four laboratories on the same rolls of prepreg. Results indicated that the residual volatiles test was too operator and equipment dependent to be reliable, and it was recommended that the test be discontinued. The resin flow test procedures were rewritten with tighter procedure control, and it is now considered to be an acceptable test. It was recommended that the filler content determination be made prior to prepregging. Author

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-30453*# National Aeronautics and Space Administration, Washington, D.C.
EXOBIOLOGY EXPERIMENTS FOR SPACE STATION
D. L. DEVINCENZI (NASA, Washington, DC) and L. D. GRIFFITHS (GE Management and Technical Services Co., Washington DC) (International Union of Physiological Sciences, Commission on Gravitational Physiology, Annual Meeting, 7th, Niagara Falls, NY, Oct. 13-18, 1985) Physiologist, Supplement (ISSN 0031-9376), vol. 28, Dec. 1985, p. S-185, S-186.

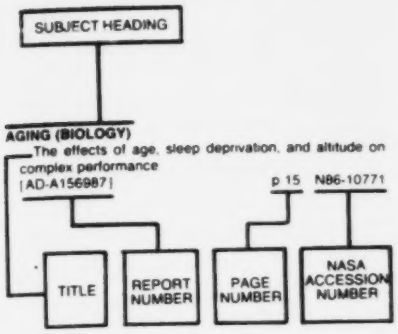
The benefits the Space Station could provide to the study of the origin, evolution, and distribution of life throughout the universe are described. Space Station experiments relevant to the cosmic evolution of biogenic elements and compounds, prebiotic chemical evolution, early evolution of life, and the evolution of advanced life forms are examined. The application of astronomical and astrometric observations to be obtained from the Space Station to the origin of life research is discussed. I.F.

A86-30697* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHOTOCHEMISTRY OF METHANE AND THE FORMATION OF HYDROCYANIC ACID (HCN) IN THE EARTH'S EARLY ATMOSPHERE
K. J. ZAHNLE (NASA, Ames Research Center, Moffett Field, CA; Michigan, University, Ann Arbor) Journal of Geophysical Research (ISSN 0148-0227), vol. 91, Feb. 20, 1986, p. 2819-2834. refs
(Contract NSF ATM-82-097960)

A one-dimensional photochemical model is used to analyze the photochemistries of CH4 and HCN in the primitive terrestrial atmosphere. CH4, N2, and HCN photolysis are examined. The background atmosphere and boundary conditions applied in the analysis are described. The formation of HCN as a by-product of N2 and CH4 photolysis is investigated; the effects of photodissociation and rainfall on HCN is discussed. The low and high CH4 mixing ratios and radical densities are studied. I.F.

A86-33390
INVESTIGATION ON THE CHIRALITY OF ELECTRONS FROM SR-90-Y-90 BETA-DECAY AND THEIR ASYMMETRICAL INTERACTIONS WITH D- AND L-ALANINES
E. CONTE (Bari, Universita, Italy) Nuovo Cimento, Lettere, Serie 2, vol. 44, Dec. 16, 1985, p. 641-647. refs

Typical Subject Index Listing



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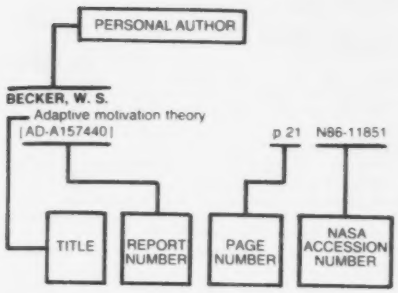

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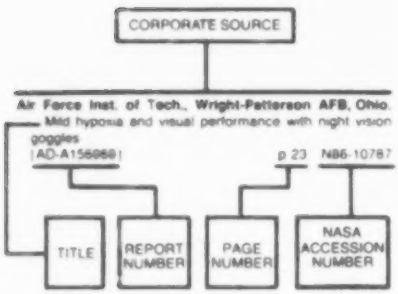

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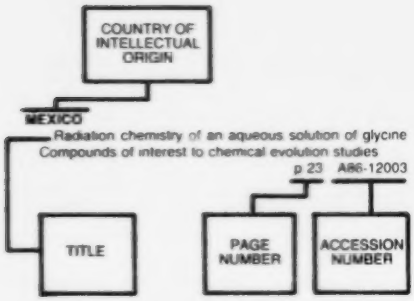

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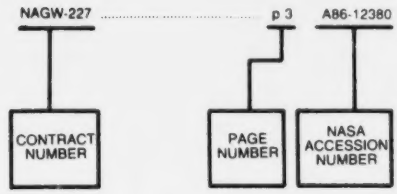

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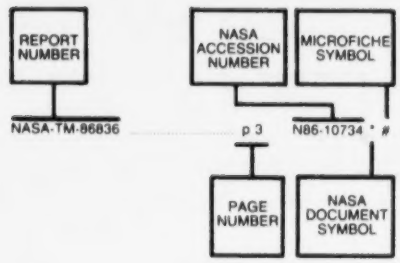

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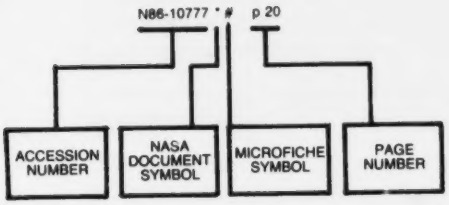

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(Supplement 288)

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In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

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An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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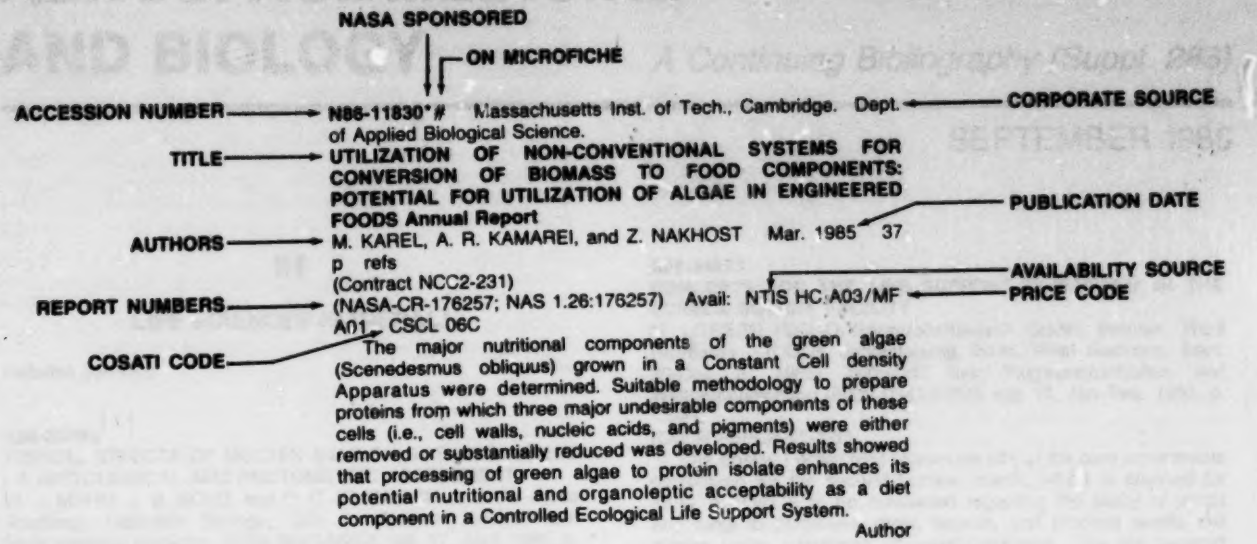
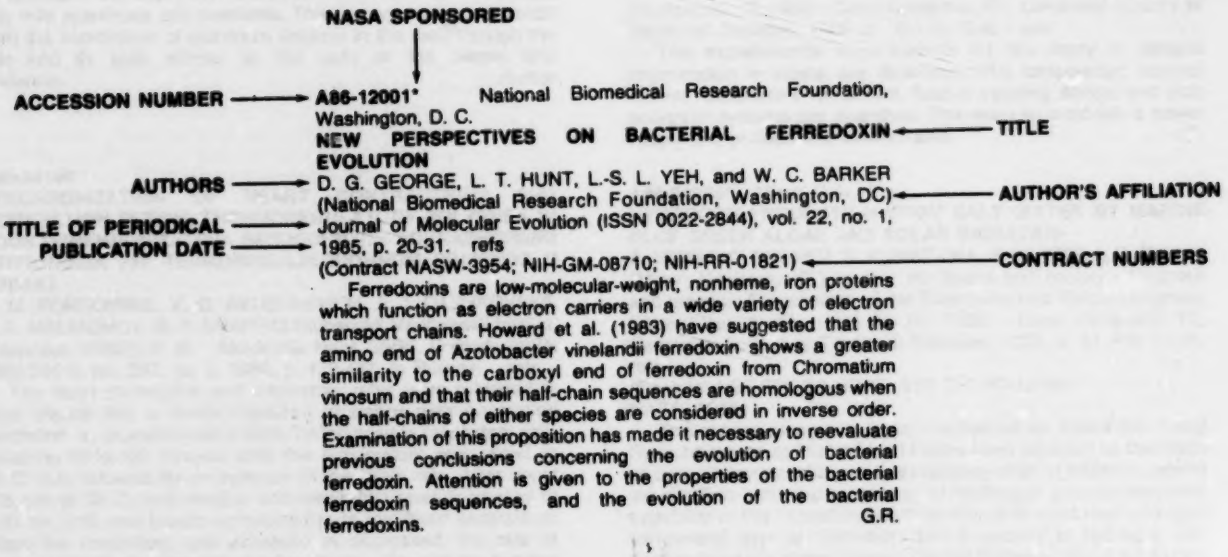
TYPICAL REPORT CITATION AND ABSTRACT


NASA SPONSORED
ON MICROFICHE
ACCESSION NUMBER
N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.
CORPORATE SOURCE
TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHORS
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
AVAILABILITY SOURCE
(Contract NCC2-231)
REPORT NUMBERS
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
PRICE CODE
COSATI CODE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT


NASA SPONSORED
ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
AUTHORS
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER
AUTHOR'S AFFILIATION
(National Biomedical Research Foundation, Washington, DC)
TITLE OF PERIODICAL
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1,
PUBLICATION DATE
1985, p. 20-31. refs
CONTRACT NUMBERS
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 288)

SEPTEMBER 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-33781
TOPICAL EFFECTS OF MOLTEN SALT ON RAT INTEGUMENT - A HISTOLOGICAL AND PHOTOMETRIC ASSESSMENT
W. J. MEHM, J. B. NOLD, and R. C. ZERNZACH (U.S. Air Force Academy, Colorado Springs, CO) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 362-366. USAF-supported research. refs

The topical effects of the molten salt 1-methyl-3-ethyl-imidazolium tetrachloroaluminate (melt) and its organic component, the organic salt 1-methyl-3 ethylimidazolium chloride were tested on rat integument. Evaluation was accomplished using standard histological techniques supplemented with digital analysis using the microscope photometer. Two groups of animals were treated with 1.5 ml of either the melt or the organic salt for 10 consecutive days. A third group treated with the melt had the treated area flushed with running water 5 min after each application (wash). Significant treatment effects were observed in rats treated with the melt and wash preparations while the effects of the organic salt were unremarkable. The melt induced an ulcerative dermatitis with acanthosis while the wash produced only mild acanthosis and dermatitis. This damage appears to result from the penetration of aluminum chloride in the melt through the skin and its toxic effects on the cells of the dermis and epidermis. Author

A86-34490
SYNCHRONIZATION OF HEART CONTRACTIONS AND RESPIRATION DURING THERMOREGULATORY POLYPNEA IN DOGS [SINKHRONIZATSIIA SERDECHNYKH SOKRASHCHENII I DYKHANIIA PRI TERMOREGULIATSIONNOM POLIPNOE U SOBAK]
V. M. POKROVSKII, V. G. ABUSHKEVICH, A. I. DASHKOVSKII, E. A. MALIGONOV, S. V. SHAPIRO (Kubanskii Meditsinskii Institut, Krasnodar, USSR) et al. Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 287, no. 2, 1986, p. 479-481. In Russian. refs

The heart contraction and respiratory rates were recorded in dogs placed into a thermoregulated chamber with controlled ventilation. In unanesthesized dogs, an increase in respiratory rate, occurring 60 to 90 minutes after the temperature was raised to 38 C, was followed by an increase in the heart rate. After about 135 min at 38 C, both cardiac and respiratory rates increased to 162/min, with one breath corresponding to one heart contraction. When the respiratory rate increased or decreased, the rate of heart contractions changed synchronously. The results suggest that, when the respiratory rate surpasses the heart rate, a common rhythm, dominated by the respiratory rhythm, develops in the cardiac and respiratory regulatory brain centers. The onset of heart and respiration rate synchronism was delayed in dogs under superficial anesthesia, while in dogs under deep anesthesia the phenomenon did not occur at all. I.S.

A86-34573
CONCEPTS FOR THE LIFE SUPPORT SUBSYSTEM IN THE EURECA BOTANY FACILITY
H. LOESER (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) (DGLR, Jahrestagung, Bonn, West Germany, Sept. 30-Oct. 2, 1985) Zeitschrift fuer Flugwissenschaften und Weltraumforschung (ISSN 0342-068X), vol. 10, Jan.-Feb. 1986, p. 13-21.
(DGLR PAPER 85-126)

The Botany Facility (BF) represents one of the core experiments considered for the second Eureca launch, which is planned for 1990. A study is to be conducted regarding the ability of plants and fungi to germinate, grow, flourish, and produce seeds and spores under conditions of weightlessness. The life support subsystem requirements are discussed along with life support subsystem concepts, and the concept of water reclamation. Attention is given to BF performance data, physiological processes in plants, upper limits of physiological rates used for the design of BF life support subsystem, the basic concepts studied for the ventilation/humidification loop, an option using water reclamation with Peltier cooling, and the concept of a cuvette with internal water management. G.R.

A86-34984
PLANARIA REGENERATION IN ZERO GRAVITY
D. K. RASHKOVER IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 10-1 to 10-4. refs

The experimental requirements for the study of planaria regeneration in space are described. The temperature control system, oxygenated containers, fixative injecting device, and data collection systems are examined. The need to establish a power supply and preload time is discussed. I.F.

A86-34985* Miami Univ., Fla.
HYDROGEN PRODUCTION FROM SALT WATER BY MARINE BLUE GREEN ALGAE AND SOLAR RADIATION
A. MITSUI, D. ROSNER, S. KUMAZAWA, S. BARCIELA, E. PHLIPS (Miami, University, FL) et al. IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 11-7 to 11-14. refs
(Contract NSF CPE-80-15142; NSF CPE-83-12092; NAS10-10531)

Two marine bluegreen algae, Oscillatoria sp. Miami BG 7 and Synechococcus sp Miami 041511 have been selected as the result of over 10 years continuous and intensive effort of isolation, growth examination, and the screening of hydrogen photoproduction capability in this laboratory. Both strains photoproduced hydrogen for several days at high rates and a quantity of hydrogen was accumulated in a closed vessel. Overall hydrogen donor substance of the hydrogen photoproduction was found to be salt water. Using strain Miami BG 7, a two step method of hydrogen photoproduction from salt water was successfully developed and this was recycled several times over a one month period using both free cells and immobilized cells in both indoor and outdoor under natural sunlight. According to these experiments, a prototype floating hydrogen

production system was designed for further development of the biosolar hydrogen production system. Author

A86-35088
PROSPECTS FOR USING MILLIMETER-BAND ELECTROMAGNETIC RADIATION AS AN EFFICIENT WAY OF OBTAINING INFORMATION ON SPECIFIC PROCESSES IN LIVING ORGANISMS [O PERSPEKTIVAKH ISPOL'ZOVANIIA ELEKTROMAGNITNYKH IZLUCHENII MILLIMETROVOGO DIAPAZONA V KACHESTVE VYSOKOINFORMATIVNOGO SREDSTVA POLUCHENIIA DANNYKH O SPETSIFICHESKIKH PROTSESSAKH V ZHIVYKH ORGANIZMAKH]
N. D. DEVIATKOV and M. B. GOLANT Pis'ma v Zhurnal Tekhnicheskoi Fiziki (ISSN 0320-0016), vol. 12, March 12, 1986, p. 288-291. In Russian. refs

Various types of electromagnetic radiation are examined from the standpoint of their information content in diagnosing living organisms. It is shown that the information value of millimeter waves is particularly high due to both a low wave propagation velocity and low energy requirements for vibration excitation at resonance frequencies characterizing the state of an organism. It is noted that millimeter waves may be particularly useful for diagnosing diseases on the basis of a radiation spectrum analysis. V.L.

A86-35863#
COMPARATIVE STUDY OF ACETAZOLAMIDE AND SPIRONOLACTONE ON REGIONAL BLOOD DISTRIBUTION ON EXPOSURE TO ACUTE HYPOBARIC HYPOXIA
S. C. JAIN, M. V. SINGH, S. B. RAWAL, H. M. DIVEKAR, and R. PARSHAD (Defence Institute of Physiology and Applied Sciences, Delhi, India) Defence Science Journal (ISSN 0011-748X), vol. 35, Oct. 1985, p. 425-429. refs

Regional blood distribution was studied in rats, which were divided into four groups viz., (1) control, (2) exposed to acute hypobaric hypoxia, (3) exposed to acute hypobaric hypoxia after oral treatment with 25 mg acetazolamide, and (4) exposed to acute hypobaric hypoxia after oral treatment with 6 mg spironolactone. The regional blood distribution was measured using radio-iodinated serum albumin (R-131 ISA). The acute hypoxic exposure results in major readjustment in the blood flow to the various organs mainly from the renal and splanchic vascular beds to the heart and brain. Treatment with acetazolamide and spironolactone results only in a slight decrease in blood contents of the heart, brain and lung as compared to the hypoxia alone exposed group. Author

A86-35938
ANTIOXIDANTS AS ANTIARRHYTHMIC REMEDIES [ANTIOKSIDANTY KAK ANTIARITMICHESKIE SREDSTVA]
V. V. FROLKIS, R. A. FROLKIS, G. IA. DUBUR, IU. V. KHMELEVSKII, V. G. SHEVCHUK (Institut Gerontologii; Institut Kardiologii, Kiev, Ukrainian SSR) et al. Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, Jan.-Feb. 1986, p. 24-32. In Russian. refs

The effect of antioxidants (alpha-tocopherol, butylated hydroxytoluene, and two derivatives of 1,4-dihydropyridine) on induced arrhythmias was studied in rats and rabbits injected with vasopressin, strophanthin, adrenalin, or calcium chloride. The results of physiological and biochemical tests have shown that preinjection with antioxidants decreases the incidence of drug-induced extrasystole, disturbances of atrioventricular conductivity, and heart fibrillation. The antioxidants prevent changes in the membrane phospholipids and activation of peroxidation, and slow down the activation of phospholipase. In addition, the antioxidants prevent decreases in Ca-ATPase and in binding and uptake of Ca(2+) by sarcoplasmic reticulum, and promote increases of sarcolemmal K,Na-ATPase and of creatine phosphokinase of sarcoplasmic reticulum. I.S.

A86-35939
CHANGES IN THE CONTRACTILE AND ELECTRICAL ACTIVITIES OF THE RAT MYOCARDIUM UNDER THE EFFECT OF VERAPAMIL UNDER INSUFFICIENT OXYGENATION [IZMENENIE SOKRATILEL'NOI I ELEKTRICHESKOI AKTIVNOSTEI MIOKARDA KRYS POD VLIIANIEM VERAPAMILA V USLOVIIAKH NEDOSTATOCHNOGO OBESPECHENIIA KISLORODOM]
I. S. MUDRAIA and IU. S. LIAKHOVICH (Ukrainskii Institut Kardiologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, Jan.-Feb. 1986, p. 60-66. In Russian. refs

A86-35940
IMPULSE ACTIVITY OF THE BRAIN STEM NEURONS RELATED TO THE CARDIAC AND RESPIRATORY RHYTHMS [IMPUL'SNAIA AKTIVNOST' NEIRONOV PRODOLGOVATOGO MOZGA, SVIAZANNAIA SERDECHNYM I DYKHATEL'NYM RITMAMI]
V. M. POKROVSKII and M. A. BOBROVA (Kubanskii Gosudarstvennyi Meditsinskii Institut, Krasnodar, USSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, Jan.-Feb. 1986, p. 98-102. In Russian. refs

A86-35941
GAMMA-AMINOBUTYRIC ACID AND BULBAR MECHANISMS OF HEMODYNAMIC REGULATION [GAMMA-AMINOMASLIANAIA KISLOTA I BUL'BARNYE MEKHANIZMY REGULIATSII GEMODINAMIKI]
M. I. GUREVICH and L. N. SHAPOVAL (AN USSR, Institut Fiziologii, Kiev, Ukrainian SSR) Fiziologicheskii Zhurnal (Kiev) (ISSN 0201-8489), vol. 32, Jan.-Feb. 1986, p. 107-114. In Russian. refs

A86-36218
IMPAIRED PULMONARY CONVERSION OF ANGIOTENSIN I TO ANGIOTENSIN II IN RATS EXPOSED TO CHRONIC HYPOXIA
R. M. JACKSON, A. J. NARKATES, and S. OPARIL (Alabama, University, Birmingham) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1121-1127. Research supported by the American Lung Association and USVA. refs
(Contract NIH-HL-22544; NIH-HL-25451)

A86-36220
PARTIAL RECOVERY OF NEUTROPHIL FUNCTIONS DURING PROLONGED HYPOTHERMIA IN PIGS
W. D. BIGGAR, C. BARKER, D. BOHN, and G. KENT (Hospital for Sick Children, Toronto, Canada) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1186-1189. Research supported by the Medical Research Council of Canada. refs

A86-36221
ONTOGENY OF HOMEOTHERMY IN THE IMMATURE RAT - METABOLIC AND THERMAL RESPONSES
D. E. SPIERS and E. R. ADAIR (John B. Pierce Foundation Laboratory, New Haven, CT) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1190-1197. refs
(Contract NIH-HD-18002)

A86-36223
EFFECTS OF EXERCISE IN NORMOXIA AND ACUTE HYPOXIA ON RESPIRATORY MUSCLE METABOLITES
R. F. FREGOSI and J. A. DEMPSEY (Wisconsin, University, Madison) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1274-1283. Research supported by the University of Wisconsin, and Army. refs
(Contract NIH-HL-15469)

Changes in rat plantaris, diaphragm, and intercostal muscle metabolites following exercise of various intensities and durations, in normoxia and hypoxia were determined. A lack of significant glycogen utilization was found in rat respiratory muscles during all normoxic conditions, and only under conditions of extreme metabolic demand, coupled with reduced O2 transport (hypoxia) did glycogen utilization increase. The initial utilization lack was

associated with elevated G6P levels. ATP concentration was maintained in all muscles, in all conditions studied, but at the expense of creatine phosphate in the diaphragm and plantaris at maximum oxygen intake (VO2max). With all types of exercise greater than 84 pct VO2max, respiratory and locomotor muscle lactate concentrations increased, though these concentrations were either equal to or lower than arterial lactate concentration, and the increase in diaphragm lactate occurred without glycogen utilization. This lactate elevation in the absence of glycogen utilization suggests that increased lactate uptake, rather than lactate production, occurred in the respiratory muscles during exhaustive exercise. K.K.

A86-36225
EFFECTS OF PRESSURE ON UPTAKE AND RELEASE OF CALCIUM BY BRAIN SYNAPTOSOMES
S. C. GILMAN, K. K. KUMAROO, and J. M. HALLENBECK (U.S. Navy, Hyperbaric Medicine Program Center, Bethesda, MD; George Washington University, Washington, DC) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1446-1450. refs
(Contract NAVY TASK MR041,01,01,1124)

Uptake of radioactive calcium from guinea pig brain fractions enriched in synaptosomes could be significantly and reproducibly decreased by exposure to high pressure. Calcium efflux from preloaded synaptosomes was unaffected by pressure exposure. It was hypothesized that the development of pressure-induced encaphalopathy may be related to an effect of pressure on the central nervous system calcium transport system. Author

A86-36368
IRON-SILICA CRYSTALLITE NUCLEATION BY BACTERIA IN A GEOTHERMAL SEDIMENT
F. G. FERRIS, W. S. FYFE (Western Ontario, University, London, Canada), and T. J. BEVERIDGE (Guelph, University, Canada) Nature (ISSN 0028-0836), vol. 320, April 17, 1986, p. 609-611. Research supported by the Ontario Geoscience Research Program. refs

The recognition of microfossils in ancient sedimentary rocks has confirmed that microrganisms which strongly resemble present-day prokaryotes existed at least 3 billion years ago. Identification of these structures is a difficult task, complicated not only by the simple morphology of microorganisms, but also by our limited understanding of the processes leading to the mineralization of individual cells and their component parts. These processes have been investigated in a natural setting, by examining sediment samples from an acidic hot spring in Yellowstone National Park. Electron microscopy and energy-dispersive X-ray spectroscopy of thin-sectioned specimens revealed remains of bacteria inside accumulations of iron and silica. Bacterial-like forms in successive stages of mineral preservation by silica were also found. Author

A86-36494
THE EFFECT OF ELECTROMAGNETIC RADIATION IN THE DECIMETER WAVELENGTH RANGE ON THE NEURONAL CALCIUM CURRENT IN MOLLUSKS [VLIIANIE ELEKTROMAGNITNOGO IZLUCHENIIA V DETSIMETROVOM DIAPAZONE DLIN VOLN NA KAL'TSIEVYI TOK NEIRONOV MOLLIUSKA]
S. I. ALEKSEEV, V. I. ILIN, and V. V. TIAZHELOV (AN SSSR, Institut Biologicheskoi Fiziki, Pushchino, USSR) Biofizika (ISSN 0006-3029), vol. 31, Mar.-Apr. 1986, p. 264-268. In Russian. refs

A86-36496
A MODEL OF THE SYSTEM CONTROLLING INVOLUNTARY EYE MOVEMENTS [MODEL' SISTEMY UPRAVLENIIA NEPROIZVOL'NYMI DVIZHENIIAMI GLAZ]
V. M. GUSEV and N. F. PODVIGIN (AN SSSR, Institut Fiziologii, Leningrad, USSR) Biofizika (ISSN 0006-3029), vol. 31, Mar.-Apr. 1986, p. 309-312. In Russian. refs

A mathematical model for the system controlling involuntary eye movements is developed in the framework of existing concepts of vision control, i.e., a correlated control of head and eye movements. The optimal control model is constructed using the quadratic criterion as a qualitative biochemical standard. Computed results are compared with experimental data on involuntary eye movements of a cat. An expression is presented for estimating the relationship between the parameters of the biochemical criterion and the retinotropic connections of a discrete locus in the external geniculate body. I.S.

A86-36497
THE RHYTHMS OF PARAMAGNETIC-CENTER CONCENTRATION IN MOUSE LIVER AND A MATHEMATICAL MODEL OF SYNCHRONIZED AUTOOSCILLATIONS [RITMY KONTSENTRATSII PARAMAGNITNYKH TSENTROV V PECHENI MYSHEI I MATEMATICHESKAIA MODEL' SINKHRONIZIROVANNYKH AVTOKOLEBANII]
V. M. CHIBRIKIN (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR), A. G. IVANNIKOVA, and V. S. SOKOLOV Biofizika (ISSN 0006-3029), vol. 31, Mar.-Apr. 1986, p. 324-329. In Russian. refs

Circadian rhythms of changes in concentration of paramagnetic particles (PMP) in mammalian liver were studied in intact mice by the method of paramagnetic electron resonance. The results were compared with the parameters obtained for a mathematical model in which the PMP biorhythms are assumed to be harmonic autooscillations subject to weak synchronization by an external electromagnetic source. Intercorrelation studies show the amplitude of the modeled external synchronizer to be one order of magnitude lower than the amplitude of the PMP biorhythms. It is suggested that the daily variations in the geomagnetic field intensity can serve as an external synchronizer for the biological PMPs. I.S.

A86-36498
THE EFFECT OF EXTERNAL FACTORS ON THE REACTIONS MODELING BIOLOGICAL PROCESSES (PICCARDI TEST) [VLIIANIE VNESHNIKH FAKTOROV NA REAKTSII, MODELIRUIUSHCHIE BIOLOGICHESKIE PROTSESSY /TEST PIKKARDI/]
A. M. OPALINSKAIA (Tomskii Gosudarstvennyi Universitet, Tomsk, USSR) Biofizika (ISSN 0006-3029), vol. 31, Mar.-Apr. 1986, p. 330-335. In Russian. refs

Data are presented on long-term studies concerning the effects of cosmoheliogeophysical factors on the hydrolysis of BiCl3 (Piccardi test) used as a model for studying cosmoregulation of biological processes. Changes, observed in the course of a year, in the time needed to sediment certain amounts of BiOCl from a standard reaction mixture were shown to correlate with such factors as the thunderstorm activity, the polarity of the interplanetary magnetic field, geomagnetic storms, anad the rotation of the sun. In experiments conducted behind steel and Permalloy, shields fluctuations in the sedimentation time were minimized, demonstrating that the external electromagnetic fields play a prominent role in the observed correlation phenomena. I.S.

N86-25109# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 5 Final Report
L. R. HOOKE, ed., M. RADTKE, ed., V. GARSHNEK, ed., R. TEETER, ed., and J. E. ROWE, ed. (Library of Congress, Washington, D.C.) Washington NASA Apr. 1986 119 p (Contract NASW-3676)
(NASA-CR-3922(05); NAS 1.26:3922(05)) Avail: NTIS HC A06/MF A01 CSCL 06C

This is the fifth issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 37 papers recently published in Russian language periodicals and bound collections and of 11 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. Additional features include a translated interview, a book review and a conference description and abstracts or titles of relevant Soviet papers presented in English at international conferences. The materials covered in this issue have been identified as relevant to 26 areas of aerospace medicine and space biology. These areas are biological rhythms, biospherics, body fluids, botany, cardiovascular and respiratory systems, endocrinology, exobiology, genetics, group dynamics, habitability and environment effects, health and medical treatment, hematology, human performance, immunology, mathematical modeling, metabolism, microbiology, morphology and cytology, musculoskeletal system, neurophysiological, nutrition, perception, personnel selection, psychology, and radiobiology. Author

N86-25110# Army Research Inst. of Environmental Medicine, Natick, Mass.
RESEARCH ANIMAL STANCHION AND TRANSPORTER
V. A. FORTE, JR. and W. A. SAWYER Jan. 1986 16 p refs (AD-A163907; USARIEM-M-12/86) Avail: NTIS HC A02/MF A01 CSCL 06C

A stanchion has been designed to restrain mid-size laboratory animals such as goats, dogs, and pigs while performing respiratory and surgical procedures. The restraint device permits control of the animal during induction and recovery from general anesthesia, provides transportation between locations, and constrains the animal during surgery without the need of a shackle device. GRA

N86-25970*# California Univ., San Francisco. Contracts and Grants Office.
PHOTOENERGY TRANSDUCTION IN HALOBACTERIUM HALOBIUM Final Report, 1 Jul. 1975 - 31 Oct. 1985
W. STOECKENIUS and R. A. BOGOMOLNI 1985 9 p refs (Contract NSG-7151)
(NASA-CR-176673; NAS 1.26:176673) Avail: NTIS HC A02/MF A01 CSCL 06C

The structure and function of a rhodopsin-like pigment bacteriorhodopsin, discovered and isolated from the membranes of the halophile Halobacterium halobium, were studied. Intermediatesm appearing in the cyclic photoreaction that drives the proton translocation, were spectroscopically characterized. The charge translocation in membrane monolayers and mulitlayers placed between electrodes were kinetically resolved. A model was developed for the proton translocation process, in which the isomerization of the retinal Schiff base decreases its pK to drive the proton off and simultaneaouly changes the connectivity from the cytoplasmic surface to the external surface. The stoichiometry of proton pumping in intact cells and the effect of the light generated electrochemical potential on the kinetics of the photoreaction cycle and the synthesis of ATP were investigated. B.G.

N86-25971*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGES: INDEX TO ISSUES 1-4
R. TEETER and L. R. HOOKE Jun. 1986 78 p refs (Contract NASW-3676)
(NASA-CR-3922(06); NAS 1.26:3922(06)) Avail: NTIS HC A05/MF A01 CSCL 06C

This document is an index to issues 1 to 4 of the USSR Space Life Sciences Digest and is arranged in three sections. In section 1, abstracts from the first four issues are grouped according to subject; please note the four letter codes in the upper right hand corner of the pages. Section 2 lists the categories according to which digest entries are grouped and cites additional entries relevant to that category by four letter code and entry number in section 1. Refer to section 1 for titles and other pertinent information. Key words are indexed in section 3. Author

N86-25972# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE FIRST CORTICAL IMPLANT OF A SEMICONDUCTOR MULTIELECTRODE ARRAY. VER (VISUAL EVOKED RESPONSES) AND PROPAGATION ANALYSIS M.S. Thesis
P. B. FITZJARRELL and R. L. SMALL Dec. 1985 185 p refs (AD-A164015; AFIT/GE/ENG/85D-15) Avail: NTIS HC A09/MF A01 CSCL 05J

This thesis reports results of the analysis of data collected from the first cortical implant of an electrode array on the primary visual cortex of a laboratory beagle. No evidence of visual evoked responses (VERs) was found in the data by summation and averaging techniques. Spatial correlation results indicate support of the hyper-column theory. Spatio-temporal correlation results indicate EEG signal propagation among the cortical columns under the array. Lack of any classic VER findings may be due to data digitization errors. Major recommendations include redigitization of the beagle data, as well as procedures for future chip implants and analyses using the Masscomp MC-500 computer. Author (GRA)

N86-25973# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
PHOSPHOROBACTERIN AND ITS EFFECTIVENESS
Y. N. MISHUSTIN 30 Jan. 1986 60 p refs Transl. into ENGLISH from Izvestiya Timiryazevskoy Sleskokhozyaystvennoy Akademii (USSR), no. 4, 1967 p 65-83
(AD-A164508; FTD-ID(RS)T-1432-84) Avail: NTIS HC A04/MF A01 CSCL 02A

As a result of works, carried out in institute of agricultural microbiology All-Union Academy of Agricultural Sciences proposed as bacterial fertilizing preparation, phosphorobacterin, which contains culture of spore-forming bacterium Bac. megaterium. This microorganism is capable to destroy organophosphorus compounds and to covert them into the form accessible to plants. Under field conditions phosphorobacterin, i.e., the preparation containing Bac. megaterium, slightly increases the yield of farm crops. According to the data of experimental institutions, the average increase in yield is about 10%. The available data show that phosphorobacterin is more effective on the soils where phosphotoacid fertilizers were applied. This gives rise to doubt as to the thesis that phosphorobacterin mainly improves phosphorus nutrition of plants. One may also consider it proved that Bac. megaterium has not any active propagation on the root surface and in the rhisosphere of plants. This fact makes one give up the theory of R.A. Menkina, the author of phosphorobacterin, about the nature of the relationship between higher plants and Bac megaterium. The available data makes one believe that the effect of phosphorobacterin is due to the presence in Bac. megaterium culture of a number of biologically active substances stimulating the first stages of the development of bacterial plants. GRA

N86-25974# Department of the Navy, Washington, D. C.
BIOSENSORS FROM MEMBRANE PROTEINS RECONSTITUTED IN POLYMERIZED LIPID BILAYERS Patent Application
P. YAGER, inventor (to Navy) 23 Aug. 1985 18 p
(AD-D012160; US-PATENT-APPL-SN-768650) Avail: NTIS HC A02/MF A01 CSCL 06A

It is an object of the present invention to provide a polymerized lipid membrane which extends the longevity and durability of lipid bilayers used in bioensors. It is another object of this invention to provide a device which is portable and can be used in the field. Another object of the present invention is to provide a quick and easy method for producing rugged biochemical sensors. These and other objects are achieved by extracting membrane proteins

from biological cells, reincorporating the proteins into a lipid bilayer contacting the bilayer, containing the membrane proteins with the environment containing the stimulus, and measuring the change in voltage or conductivity across the bilayer. The voltage or conductivity change indicates the presence of the stimulus and the magnitude of the voltage or conductivity change indicates the amount of the stimulus present. The polymerized lipid membrane provides a rugged support for the proteins that function to sense molecules in the external environment. The acetylcholine receptor protein is purified by affinity chromatography reincorporated into lipid vesicles of polymerized lipids, and mounted on a glass microelectrode to produce a lipid bilayer containing the reincorporated proteins. One electrode from the silver-silver chloride pair is mounted on each side of the bilayer. The electrodes can measure the change in current across the bilayer when the acetylcholine receptor protein is effected by cholinergic agonists. GRA

N86-25975# Department of the Navy, Washington, D. C.
MAGNETIC SEPARATION DEVICE Patent Application
G. M. STARKEN, J. CAVIN, R. A. QUINNELL, C. A. TWIGG, and D. P. CRAWFORD, inventors (to Navy) 25 Sep. 1985 28 p refs
(AD-D012163; US-PATENT-APPL-SN-780123) Avail: NTIS HC A03/MF A01 CSCL 06L

This invention pertains to magnetic separation devices and more particularly to; magnetic separation devices used to selectively remove magnetic bead-coated cells from tissues such as bone marrow or blood. Depletion of cell populations from boner marrow has been mainly approached using antibodies conjugated to toxins such as ricin or with antibodies complement to effect lysis of the target cells. These techniques have several disadvantages including difficulty in measuring the selective cell kill in the marrow, non-specific toxicity of either toxins or complement, and the necessity to prepare large amounts of complement. In addition, many antibodies are neither cytotoxic with complement nor toxin conjugates. Polymeric microspheres conjugated to antibodies have been used to probe the cell surface for receptor sites using scanning electron microscopy. Iron-containing polymeric microspheres tagged with fluroescent dyes conjugated to antibodies were used to separate red blood cells and lymphoid cells by binding the antibody-microsphere to selected cells and exposing the cell population to a magnetic field. Over 99% of the bound cells were attracted by the magnet. GRA

N86-25976# Ottawa Univ. (Ontario). Dept. of Electrical Engineering.
STUDIES OF THE ELECTRIC FIELD DISTRIBUTION IN BIOLOGICAL BODIES. EXPERIMENTAL DOSIMETRY AT RADIOFREQUENCIES Final Report, Dec. 1981 - Sep. 1985
S. S. STUCHLY and M. A. STUCHLY 5 Dec. 1985 70 p refs
(Contract N00014-82-G-0011)
(AD-A163156) Avail: NTIS HC A04/MF A01 CSCL 06R

The objective of the project was to develop and evaluate a computer-controlled system for measurements of the spatial distribution of the specific absorption rate (SAR) in biological bodies and to perform measurements on a model of the human body, with particular emphasis on exposures in the near-field of antennas. Far-field exposures at frequencies above 160 MHz, in spite of large gradients, local values of the SAR are only about 20 times higher than the whole-body average SAR for homogeneous models of human body. However, an additional increase by a factor of 4 to 5 can be anticipated at interfaces of high water content tissues with air (gas) pockets and low water content tissues. The existence of large gradients and high local SARs, as confirmed by our results, further supports an accepted view that biological effects at relatively low average SARs are due to thermal interactions. For humans, high SARs occur in the neck, and the ratio of the SAR in the neck to the whole-body average increases with frequency. Near-field exposures, based on the experimental findings we believe that because of the spatial pattern of energy deposition, the whole-body average SAR is not an adequate dosimetric measure for near-field exposures. GRA

N86-25977# Los Alamos National Lab., N. Mex.
DNA ANALYSIS OF EPITHELIAL CELL SUSPENSIONS
J. S. WILSON, N. F. JOHNSON, and L. M. HOLLAND 1985 22 p refs Presented at the Hanford Life Sciences Symposium, Richland, Wash., 21 Oct. 1985
(Contract W-7405-ENG-36)
(DE86-002403; LA-UR-85-3588; CONF-8510225-1) Avail: NTIS HC A02/MF A01

Cell suspensions of skin were obtained by animals exposed by skin painting of several crude oils. DNA analysis of these cell suspensions labeled with mithramycin provide determination of percentages of cells in the G1, S and G2M phases of the cell cycle. Data acquired showed differences from control animals occurring as early as 7 days after treatment and persisting through 21 days afterwards. There was histological evidence of erythema and hyperplasia in shale oil-exposed skins. Flow cytometric analysis of DNA content in shale-oil-exposed skin cells showed an increased percentage of cycling cells plus evidence of aneuploidy. Similar data from simply abraded skin showed increased percentages of cycling cells, but no aneuploidy. The shale-oil-exposed group, when compared to a standard petroleum-exposed group, had significantly increased percentages of cycling cells. This early indication of differing response to different complex mixtures was also seen in long-term skin exposures to these compounds. Similar analytical techniques were applied to tracheal cell suspensions from ozone-exposed rats. DOE

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-33754
COMPARISON OF HUMAN IMPACT RESPONSE IN RESTRAINT SYSTEMS WITH AND WITHOUT A NEGATIVE G STRAP
B. F. HEARON and J. W. BRINKLEY (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 301-312. refs
(Contract F33615-79-C-0523)

The effect of a negative G strap on restraint dynamics and human impact response was evaluated in forward-facing (-Gx) and vertical (+Gz) impact tests performed under different test conditions. In both axes, the experimental exposure was an approximate half-sine waveform, with peak acceleration up to 10 G and velocity change up to 9.2 m/s. Subjects were restrained to the test vehicle using either the PCU-15/P torso harness and lap belt (used operationally in such aircraft as the A-20 and F-15), or a conventional double shoulder strap and lap belt configuration, with fixed-length negative G straps incorporated into half of the experiments. Adding the negative G strap to either restraint system had clearly beneficial effects, including a decreased tendency toward submarining in forward-facing impacts, providing better occupant-seat coupling during free falls, and improving vertical impact protection. Conventional double shoulder strap and lap belt restraint provided better forward-facing and vertical impact protection than the PCU-15/P-including configuration. I.S.

A86-33755
MILD HYPOXIA AND VISUAL PERFORMANCE WITH NIGHT VISION GOGGLES
L. L. LEBER, S. N. ROSCOE, and G. M. SOUTHWARD (New Mexico State University, Las Cruces) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 318-324. refs

Military night vision goggles (NVGs) are image intensifiers normally used when the human operator's visual capabilities are unimpaired by oxygen deprivation. However, mountain search team

members and aviators sometimes operate with NVG augmentation of altitudes where hypoxic visual decrement is documented. The objective of this research was to investigate the effects of mild hypoxia on monocular visual performance with NVGs. It was found that mild oxygen deprivation significantly affects unaided square-wave grating visual acuity but does not significantly affect NVG-augmented performance. Large differences between visual sensitivities at different spatial frequencies were not differentially affected by mild hypoxia. Supplemental oxygen did significantly improve naked-eye but not NVG-augmented night resolution acuity up to a simulated altitude of 13,000 ft (3,962 m) above sea level (ASL). Author

A86-33756* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
EFFECT OF SIMULATED WEIGHTLESSNESS ON EXERCISE-INDUCED ANAEROBIC THRESHOLD
V. A. CONVERTINO, G. M. KARST, C. R. KIRBY, and D. J. GOLDWATER (NASA, Kennedy Space Center; Bionetics Corp., Cocoa Beach, FL; NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 325-331. refs

The effect of simulated weightlessness, induced by ten days of continuous bedrest (BR) in the -6 deg head-down position, on the exercise-induced anaerobic threshold (AT) was determined by comparing specific ventilatory and gas-exchange measurements during an incremental ergometer test performed before and after BR. The primary index for determining the exercise-induced AT values of each subject was visual identification of the workrate or oxygen uptake (VO2) at which the ratio of the expired minute ventilation volume (VE) to VO2 exhibited a systematic increase without a concomitant increase in the VE/VCO2 value. Following BR, the mean VO2max of the subjects decreased by 7.0 percent, and the AT decreased from a mean of 1.26 L/min VO2 before BR to 0.95 L/min VO2 after BR. The decrease in AT was manifested by a decrease in both absolute and relative workrates. The change in AT correlated significantly with the change in plasma volume but not with the change in VO2max. The results suggest that the reduction in AT cannot be completely explained by the reduction in VO2, and that the AT decrease is associated with the reduction in intravascular fluid volume. I.S.

A86-33757
SYSTOLIC TIME INTERVALS IN PILOTS AND NON-PILOTS DURING 70 DEG HEAD-UP TILT
M. B. DIKSHIT, P. K. BANERJEE, P. L. N. RAO, and E. M. IYER (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 332-335. Research supported by Armed Forces Medical Services of India. refs

Nine highly experienced Indian fighter pilots in current flying practice and 11 healthy nonpilots underwent head-up tilt (HUT) to 70 deg for 20 min. Heart rate and blood pressure response to tilt stress was similar in the two groups, as was the contractile function of the left ventricle measured by systolic time intervals. The highest prejection period/left ventricular ejection time ratio of 0.402 seen at the end of HUT was considerably lower than the values seen in studies of Grayboys et al. (1974) and Stafford et al. (1970). This suggests that myocardial contractility of Indians adjusts better to tilt stress than that of western subjects not adapted to heat. Author

A86-33758* California Univ., Berkeley.
ADAPTED HEAD- AND EYE-MOVEMENT RESPONSES TO ADDED-HEAD INERTIA
G. M. GAUTHIER, B. J. MARTIN, and L. W. STARK (California, University, Berkeley) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 336-342. refs
(Contract NCC2-86; CNRS-ERA-272)

Adaptation to inertia added to the head was studied in men by mounting masses on a rigidly attached helmet until two- to ten-fold increases of inertia were produced, while an overhead suspension compensated for the weights. The observed changes in the eye and head movement coordination included increased head movement latencies, as well as changes in the eye movement amplitude, and later stabilizing alternate contractions of the neck muscles. Oscillopsia, or continual displacement or instability of the visual world, which is a symptom of a breakdown of space constancy, was prominent and consistent in the perceptual reports of the subjects. Although adaptation resulting from adding inertia to the head occurred much faster than that induced by adding prisms or lenses, it has similar perceptual and motor components that may be objectively studied in detail. I.S.

A86-33759* Brandeis Univ., Waltham, Mass.
SUDDEN EMESIS FOLLOWING PARABOLIC FLIGHT MANEUVERS IMPLICATIONS FOR SPACE MOTION SICKNESS
J. R. LACKNER (Brandeis University, Waltham, MA) and A. GRAYBIEL (U.S. Navy, Naval Aerospace Medical Research Laboratory, Pensacola Naval Air Station, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 343-347. refs
(Contract NAS9-15147)

Episodes of emesis unaccompanied by the usual prodomal signs of motion sickness have been reported by astronauts in the Space Shuttle program. Such reports have raised the issue whether space motion sickness has different characteristics from terrestrial motion sickness. Evidence is presented here from parabolic flight experiments that sudden vomiting can occur in response to a provocative vestibular stimulus even when no premonitory symptoms are being experienced. Accordingly, in chronic exposure conditions, the absence of prominent signs or symptoms of motion sickness does not necessarily mean an absence of sensitization. Author

A86-33760
ANALYSIS OF THE POTENTIAL ASSOCIATION BETWEEN NOISE-INDUCED HEARING LOSS AND CARDIOVASCULAR DISEASE IN USAF AIRCREW MEMBERS
S. J. KENT, H. E. VON GIERKE, and G. D. TOLAN (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH; USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 348-361. refs

The purpose of this investigation was to explore the relationship between noise-induced hearing loss and cardiovascular disease by examining the medical records of 2250 Air Force aircrew members. In this correlative analysis, high-tone hearing loss diagnosed with a high probability of being noise-induced was interpreted as an indirect indicator of noise exposure. Cardiovascular function was measured in terms of recorded systolic and diastolic blood pressure and clinical diagnoses of cardiovascular diseases. Analyses consisted of comparing cardiovascular parameters in maximum and minimum hearing loss groups, including polynomial regression curves for blood pressure data, and determining relative risk and attributable risk associated with noise-induced hearing loss for development of cardiovascular disease. The analyses consistently failed to indicate any association between the degree of noise-induced hearing loss and cardiovascular function in the aircrew population. Author

A86-33762
SYSTOLIC BLOOD PRESSURE IN FIGHTER PILOTS AFTER 12-15 YEARS SERVICE
P. FROOM, M. GROSS, J. BARZILAY, D. F. FORECAST, S. MARGALIOT (Israel Air Force, Aeromedical Centre, Tel Hashomer; Hadassah University Hospital, Jerusalem, Israel) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 367-369. refs

Systolic blood pressure (SBP) was measured at entry and after 12-15 years in 112 fighter pilots and compared to 112 transport and helicopter pilots. the pilots were 20-24 years old on entry into the study. Mean SBP + or - 1 S.D on entry was 122 + or - 12 mm Hg in fighter pilots and 124 + or - 12 mm Hg in transport and helicopter pilots. After 12-15 years follow-up, the mean SBP was 118 + or - 12 mm Hg in both groups. It is concluded that

the stress of flying fighter aircraft for 12-15 years is not associated with an increased risk of hypertension. Author

A86-33763
RETROSPECTIVE ANALYSIS OF NAVAL SPECIAL BOARDS OF FLIGHT SURGEONS, 1974-83
W. D. LOVAN, R. A. WEAVER, R. J. LENTZ, J. K. GOODRUM, and B. F. WITHERS, III (U.S. Navy, Naval Aerospace Medical Institute, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, April 1986, p. 370-375. refs

The Naval Special Board of Flight Surgeons (SBFS) was established in 1956 for the evaluation of Navy, Marine Corps, and Coast Guard problem aeromedical cases. This paper examines a sample consisting of 248 of these cases for the period of 1974-83 with respect to the characteristics of those referred, their referral diagnostic category, and the recommendation of the Special Board regarding return to a flying status. Those cases with a referral diagnostic category of ENT and Ophthalmology were less likely to be returned to flight status. Older, more senior pilots, and pilots with more total flight time were less likely to be returned to unrestricted flying than were their younger, more junior, and less experienced counterparts. Otherwise, no significant difference in outcome based on age, rank, marital status, branch of service, specialty, or flight hours was detected. Overall, 61 percent of those evaluated by the SBFS were returned to flight status. Author

A86-33801
ZONAL DIFFERENTIATION OF PERFORMANCE UNDER HEAT STRESS
P. A. HANCOCK and A. A. BEHNKE (Southern California, University, Los Angeles, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 585-589. refs

This paper details four discrete zones which describe the limit of human physiological and performance capabilities in conditions of elevated environmental temperature. Boundaries to these zones are expressed in both environmental and physiological parameters. The practical application of these zones may be realized where individuals are exposed to continuous or intermittent heat stress. Author

A86-33838
NONIONIZING RADIATION DAMAGE IN THE EYE
R. L. MCCALLY, R. A. FARRELL, C. B. BARGERON, H. A. KUES, and B. F. HOCHHEIMER (Johns Hopkins University, Laurel, MD) Johns Hopkins APL Technical Digest (ISSN 0270-5214), vol. 7, Jan.-Mar. 1986, p. 73-91. Research supported by the Independent Research and Development Funds, Wilmer Institute, Army, and Navy. refs

Damage mechanisms in corneas exposed to infrared and microwave radiation and retinas exposed to visible light are discussed. A new thermal-damage model for describing threshold damage to the cornea's front cellular layer caused by the absorption of CO2 laser infrared radiation is discussed, in addition to the healing and repair processes that follow exposure. In the model, damage is associated with the occurrence of a phase transition, and a physical explanation is provided for the small variation in temperature rise observed at the damage threshold condition for different exposure durations. Morphological changes in the cornea's posterior cellular layer induced by exposure to low-level microwave radiation are described, and a new low safe-exposure level for microwaves is suggested. Blue or violet light low-level exposure diagnostic techniques such as retinal photography are found to be inadequate, and new techniques based on the measurement of several fluorescent properties of probe dyes are presented. R.R.

A86-35285#
MEDICAL PROBLEMS OF SPACE FLIGHTS
P. C. CHATTERJEE (Indian Air Force, New Delhi, India) Aviation Medicine, vol. 29, June 1985, p. 9-12.

A general introduction to the various environmental stresses on man during space flight has been presented. These can broadly be divided into dynamic, physical and internal elements. Most of the body systems are adversely affected due to weightlessness. Some of the important aspects have been highlighted with requirement of possible prophylactic methods and methods of adaptation. Author

A86-35287#
MEDICAL EVALUATION OF COSMONAUTS DURING SPACE FLIGHT AND IMMEDIATE PRE AND POST FLIGHT PERIODS
P. M. SUNDARAM (Indian Air Force, Institute of Aviation Medicine, Bangalore, India) Aviation Medicine, vol. 29, June 1985, p. 18-22.

Procedures and tests performed in the preflight medical evaluation and maintenance, in-flight monitoring, and postflight evaluation of a spacecraft personnel crew that included an Indian cosmonaut are described. The preflight tests included a cardiovascular evaluation (tilt table tests, echocardiogram and electrocardiograms taken at rest and on an ergometer); (2) ophthalmological evaluation (perimeter studies, the adaptometer and the ocular muscle balance tests, and visual acuity studies); (3) vestibular evaluation; (4) dental evaluation; and (5) biochemical tests to serve as the baseline data. In addition to physical exercises, the Indian cosmonauts have carried out daily yoga exercises. The postflight medical evaluation indicated that the preflight medical program was adequate for the purposes of selection and training for flight missions. I.S.

A86-35288#
VECTORCARDIOGRAPHIC STUDIES DURING INDO-SOVIET JOINT SPACE PROJECT
B. R. S. REDDY, G. S. NAYAR (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), and P. C. CHATTERJEE (Indian Air Force, New Delhi, India) Aviation Medicine, vol. 29, June 1985, p. 23-30. refs

This paper presents the results of one of the first in-flight vectorcardiographic (VCG) studies along with preflight and postflight records. VCG data from two cosmonauts were recorded before, during, and after flight, while at rest and also during and after exercise on a bicycle ergometer. There was an increase in size of in-flight VCG loops and a decrease during the postflight period with recovery within four days. Short duration weightlessness did not have any negative effect on the functional state of the heart, as evidenced from cardiac vector studies. Author

A86-35290#
EVALUATION OF PRECORDIAL MAPPING BEFORE AND AFTER SUBMAXIMAL EXERCISE AMONGST NORMAL AND ASYMPTOMATIC SUBJECTS WITH NON SPECIFIC ST-T ABNORMALITIES
M. M. SINGH (Air Force Central Medical Establishment, New Delhi, India), B. R. S. REDDY (Indian Air Force Institute of Aviation Medicine, Bangalore, India), J. S. KULKARNI (Air India, Bombay), and S. K. ADAVAL (Command Hospital, Bangalore, India) Aviation Medicine, vol. 29, June 1985, p. 38-42. refs

Using the automatic lead selector device of Reddy et al. (1981) and a conventional ECG machine, 16-point precordial ST-T mapping was conducted, before and after submaximal exercise, on 20 normal subjects, 61 subjects with nonspecific ECG abnormalities, three subjects with chest pain symptoms, and seven subjects with stabilized ischemic heart disease (IHD). The 16-point mapping helped to correctly diagnose ST-T changes in 71.4 percent of the IHD group. In contrast, this procedure ruled out IHD in 95.1 percent of the group with nonspecific ECG abnormalities. The observed ST-T changes were frequently seen in the No. 11 to No. 16 points of the maps. I.S.

A86-35291#
RESPIRATORY DISEASES - AEROMEDICAL ASPECTS INCLUDING DISPOSAL
J. S. KULKARNI (Air India, Bombay) Aviation Medicine, vol. 29, June 1985, p. 51-55.

Physiological determinants used in evaluating pilots for flying fitness are discussed. Special consideration is given to testing tolerance to respiratory stress due to environmental hypoxia and to Gz and Gx accelerations, as well as to diagnosing functional defects of the respiratory system. The respiratory indices used in differentiating between various types of ventilation defects (obstructive and nonobstructive) and of diffusion defects (due to pneumonia, asthma, pleural effusion, chronic bronchitis, emphysema, and pulmonary fibrosis) are described. Sixteen subjects with respiratory diseases, diagnosed in the course of an evaluation performed on 1445 subjects at the Institute of Aviation Medicine, were subjected to hypoxia stress and acceleration profile tests. Out of these, only two pilots have been permanently grounded, while four others were put back to full flying duties. It is noted that, in spite of the widespread habit of smoking in the Air Force, no cases of chronic bronchitis with emphysema have been detected. I.S.

A86-36219
CUTANEOUS VASCULAR RESPONSES TO HEAT SIMULATED AT A HIGH ALTITUDE OF 5,600 M
S. SAGAWA, K. SHIRAKI, and N. KONDA (University of Occupational and Environmental Health, Kitakyushu, Japan) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1150-1154. refs

Changes in cutaneous circulation due to hypoxia during simulated high altitude heat exposure are investigated. Six men were placed in an altitude chamber at 5600 m and were subjected to a 60-min heat exposure. After a 60-min equilibrium period at thermoneutrality (28 C), a heat load was provided by an increase in chamber temperature to 38 C at a rate of 1 deg min. Skin blood flow in the forearm (FBF) and finger (FiBF), skin and esophagus temperatures, and cardiac output (CO) were measured during heat exposure at 5,600 m and at sea level, and during the high altitude thermoneutral period. During thermoneutrality, hypoxia increased the mean skin temperature and mean heat transfer coefficient, as well as FBF and forearm vascular conductance, though no alteration in CO or in total peripheral resistance was found. During heat exposure, esophagus temperature rose faster at high altitude than at sea level. However, post-exposure data indicate that with the exception of FiBF, all thermal as well as circulatory parameters were unaffected by altitude. This attenuated vasodilation in the fingers suggests differential vascular controls and possible impairment of thermoregulation when additional stress, such as heat, is imposed. It can be concluded that cutaneous vasodilation caused by heat exposure is not induced uniformly over the whole body in a hypoxic environment. K.K.

A86-36222
TIME COURSE OF MUSCULAR BLOOD METABOLITES DURING FOREARM RHYTHMIC EXERCISE IN HYPOXIA
J. RAYNAUD, D. DOUGUET, P. LEGROS, A. CAPDEROU, B. RAFFESTIN (Paris XI, Univesite; Centre Chirurgical Marie-Lannelongue, Le Plessis-Robinson, France) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1203-1208. Research supported by the Universite de Paris XI; Ministere de la Recherche et de la Technologie of France. refs
(Contract MRTF-82,J,0159)

The time course of local muscular metabolism, when arterial afferent blood remains unaltered, was studied. O2, concentration, PO2, PCO2, pH, osmolarity, and lactate, and Hb concentrations in forearm venous blood were measured during the submaximal exercise of forearm muscles. Blood composition was determined at times of rest and exercise; in normoxic and hypoxic environments. In hypoxia the venous muscular blood PO2 and O2 concentration was lower at rest and during exercise. The muscular arteriovenous O2 difference during exercise in hypoxia was increased by 10 pct compared with normoxia, which implies a similar increase in muscular blood flow, assuming exercise O2 consumption was not affected by hypoxia. Changes in PCO2 and pH magnitude were smaller in hypoxia during exercise and recovery, suggesting an increase in reduced Hb. An increase in muscular venous Hb coupled with unaltered arterial blood, poses the possibility of a continuous transcapillary water leakage during the first five minutes of exercise. It is concluded that muscular blood composition is less affected by hypoxia than expected. K.K.

A86-36224
LOW ACUTE HYPOXIA VENTILATORY RESPONSE AND HYPOXIC DEPRESSION IN ACUTE ALTITUDE SICKNESS
L. G. MOORE, G. L. HARRISON, R. E. MCCULLOUGH, R. G. MCCULLOUGH, A. J. MICCO (Colorado, University, Denver; Colorado State University, Fort Collins) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, April 1986, p. 1407-1412. refs
(Contract NIH-HL-14985)

It is hypothesized that low initial hypoxic ventilatory response and/or subsequent greater blunting by hypocapia or prolonged hypoxia would lower ventilation at high altitude in symptomatic compared to asymptomatic individuals. Eight subjects with histories of acute altitude sickness were compared with four subjects who had been asymptomatic during prior altitude exposure. At a simulated altitude of 4800 m, the susceptible group developed symptoms of altitude sickness and had lower minute ventilations and higher end-tidal PCO2 than the asymptomatic subjects. In measurements made prior to altitude exposure, ventilatory responsiveness to hypoxia was reduced in symptomatic compared to asymptomatic subjects, under both isocapnic and and poikolocapnic conditions. Diminution of the poikolocapnic relative to the isocapnic hypoxic response was similar in both groups, characterized by a ventilation decrease and an end-tidal PCO2 increase. It is concluded that hypoventilation in symptomatic compared to asymptomatic subjects is greater as a result of both a lower acute hypoxic response and a subsequent greater blunting of ventilation at high altitude. K.K.

A86-36309
HEMODYNAMIC RESPONSE TO LBNP FOLLOWING 2 HOURS HDT (-6 DEG)
H. LOELLGEN, K. E. KLEIN, U. GEBHARDT, J. BEIER, J. HORDINSKY (DFVLR, Institut fuer Flugmedizin, Cologne; Freiburg, Universitaet, Freiburg im Breisgau; Bonn, Universitaet, West Germany) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 406-412. refs

Central hemodynamics have been determined during stepwise decreasing lower body pressure in head-down tilt of -6 deg. Measurements were performed on eight healthy volunteers using right heart catheterization. During lower body negative pressure (LBNP), pressures in the right atrium, pulmonary artery, and pulmonary capillary (preload) decreased in parallel with the increase of negative pressure applied to the lower part of the body. Similarly, stroke volume and cardiac output decreased with increasing negative pressure. Heart rate moderately increased (30 percent) as well as total peripheral resistance. The left ventricular function curve was shifted downward and to the left during LBNP indicating hypovolemia with no evidence of decreased contractility. Cardiac dimensions determined by echocardiography changed in a similar way as those obtained by invasive measurements. There was a very close correlation between stroke volume determined by thermodilution and by echocardiography. Plasma norepinephrine and dopamine tended to increase at the end of LBNP. Echocardiography proved a useful and reliable approach to hemodynamic measurement during LBNP and is recommended for analysis of hemodynamic parameters during zero G and Gz simulation. Author

A86-36310* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARDIOVASCULAR DYNAMICS ASSOCIATED WITH TOLERANCE TO LOWER BODY NEGATIVE PRESSURE
T. M. SATHER, D. J. GOLDWATER, L. D. MONTGOMERY (NASA, Ames Research Center, Moffett Field, CA; Arizona, University, Tucson), and V. A. CONVERTINO (Bionetics Corp., Cocoa Beach, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 413-419. refs

The purpose of this investigation was to identify cardiovascular responses associated with tolerance to lower body negative pressure (LBNP). Eighteen men, ages 29-51 years, were categorized as high (HT) or low (LT) LBNP-tolerant based on a graded presyncopal-limited LBNP exposure criterion of -60 mm Hg relative to ambient pressure. Groups were matched for physical characteristics and pre-LBNP cardiovascular measurements, with the exceptions of greater (p less than 0.05) end-diastolic volume and cardiac output in the HT group. During peak LBNP, cardiac output was similar in both groups, although the HT group displayed a greater heart rate (p less than 0.05). In both groups, venous return appeared to limit cardiac output resulting in decreased arterial pressure. Tolerance to LBNP did not appear solely dependent on the absolute amount of blood pooled in the legs since the HT group demonstrated a greater (p less than 0.05) peak LBNP-induced increase in midthigh-leg volume. Greater tolerance to LBNP was associated with a larger pre-LBNP cardiac output reserve and higher compensatory increases in heart rate and peripheral resistance. Author

A86-36311* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
EFFECT OF HYDRATION ON PLASMA VASOPRESSIN, RENIN, AND ALDOSTERONE RESPONSES TO HEAD-UP TILT
M. H. HARRISON, G. GEELEN, L. C. KEIL, C. A. WADE, L. C. HILL (NASA, Ames Research Center, Moffett Field; Letterman Army Institute of Research, San Francisco, CA) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 420-425. refs

If plasma vasopressin (PVP), plasma renin (PRA), and plasma aldosterone (PA) responses to change in posture are mediated only by alterations in intrathoracic baroreceptor activity hydration status should have minimal influence on these responses. To test this hypothesis, six male subjects underwent 45 min of 70 deg head-up tilt (HUT) following 26 h dehydration, and again, 105 min later, following rehydration. Compared with preceding supine hydrated control values, PVP, PRA, and PA increased (p less than 0.001) during dehydrated HUT, but only PVP and PRA increased during rehydrated HUT (p less than 0.001). The dissociation during rehydrated HUT of PRA and PA may have been related more to the reduction (p less than 0.001) in plasma potassium concentration than to the accompanying decrease (p less than 0.001) in plasma osmolality and sodium concentration. Although increases in PVP and PRA during HUT were attenuated (p less than 0.01) following rehydration, this attenuation was associated with the absence of symptoms of overt hypotension following rehydration. However, since rehydration did not abolish the increases in PVP and PRA induced by HUT, it is concluded that the present observations support the concept of intrathoracic baroreceptor involvement in the regulation of vasopressin secretion and renin release. Author

A86-36312* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PLASMA VISCOSITY ELEVATIONS WITH SIMULATED WEIGHTLESSNESS
D. G. MARTIN, V. A. CONVERTINO, D. GOLDWATER, E. W. FERGUSON, and E. B. SCHOOMAKER (NASA, Ames Research Center, Moffett Field, CA; Uniformed Services University of the Health Sciences, Bethesda, MD; Arizona, University, Tucson) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 426-431. refs

A hypothesis correlating an increase in blood viscosity during bed rest to a decrease in aerobic capacity during simulated weightlessness is tested. Eight human subjects were studied on the sixth day of bed rest during two consecutive 10-d bed rest periods separated by a 14-d recovery interval designed to simulate the flight-layover schedule of Shuttle astronauts. Plasma viscosity and volume were measured, together with maximal aerobic capacity (VO2max). An increase in hematocrit, plasma protein, and fibrinogen concentrations was found, contributing to an elevation in plasma viscosity. VO2max decreased significantly in the first, but not the second bed rest cycle, and though many individuals exhibited a decrease in plasma volume and aerobic capacity coupled with elevated plasma viscosity, correlations between these variables were lacking. It is concluded that the decrease in VO2max observed following simulated weightlessness cannot be attributed to alterations in muscle blood flow resulting from increased blood viscosity. K.K.

A86-36313
INFLUENCE OF INSPIRED OXYGEN CONCENTRATION ON ACCELERATION ATELECTASIS
M. S. HASWELL, W. A. TACKER, JR., U. I. BALLDIN, and R. R. BURTON (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 432-437. refs

The USAF is developing an On Board Oxygen Generation System (OBOGS) for use in fighter aircraft. This study was conducted to determine the inert gas dilution requirements of the OBOGS necessary to prevent acceleration atelectasis. Human subjects were exposed to either 21, 50, 70, 82.5, 95 or 100 percent inspired oxygen, along with an increased +Gz Simulated Aerial Combat Maneuver (SACM) profile using a human centrifuge. The SACM profile utilized four +4.5z peaks (136 s at this +Gz) superimposed on a +3 Gz baseline, representing a total ride time of 276 s. A significant reduction in vital capacity (VC) occurred at inspired oxygen concentrations of 70 percent and greater. The addition of 5 percent argon (a natural product of OBOGS) to pure oxygen did not reduce the magnitude of acceleration atelectasis observed, nor the severity of breathing symptoms. A 30-s exposure to positive pressure breathing at 30 mm Hg during the end of the SACM reduced the level of VC reduction caused by subjects breathing 100 percent oxygen during +Gz. Author

A86-36314
LONGITUDINAL STUDY OF CARDIOVASCULAR DISEASE IN U.S. NAVY PILOTS
A. HOIBERG (U.S. Navy, Naval Health Research Center, San Diego, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 438-442. refs

This longitudinal study examined the consequences of cardiovascular disease (CVD) in 145 U.S. Navy pilots who suffered a CVD incident during the 1972-79 time period. Results showed that one pilot died, one suffered a second acute myocardial infarction, and 32 pilots were hospitalized and/or retired with a physical disability because of CVD. The majority of subsequent CVD incidents occurred during a 12-month period after the initial CVD event; 35 percent had discontinued flying prior to the initial CVD incident. Percentages of pilots who either remained on active duty or were separated for nonmedical reasons ranged from 64.3 percent for pilots in the chronic ischemic heart disease sample to 97.6 percent for the symptomatic heart disease group. Thus, the majority of pilots were returned to duty either after the initial CVD incident or subsequent to the rehospitalization or physical evaluation board. Author

A86-36315* Brandeis Univ., Waltham, Mass.
HEAD MOVEMENTS IN NON-TERRESTRIAL FORCE ENVIRONMENTS ELICIT MOTION SICKNESS - IMPLICATIONS FOR THE ETIOLOGY OF SPACE MOTION SICKNESS
J. R. LACKNER and A. GRAYBIEL (Brandeis University, Waltham, MA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 443-448. refs
(Contract NAS9-15147)

Space motion sickness has become an operational concern in manned space flight. Considerable evidence exists that head

movements in free fall, especially pitch movements, are provocative until adaptation occurs. The question arises whether space motion sickness is an unique nosological entity or is due to body movements in a nonterrestrial force environment, a force environment for which the body's dynamic sensory-motor adaptions to 1 G are no longer appropriate. To evaluate this issue, subjects were asked to make controlled head movements during exposure to high gravitoinertial force levels, 1.8-2.0 G, in parabolic flight maneuvers. Head movements in pitch with eyes open were most evocative of motion sickness, yaw movements with eyes covered were least provocative. This pattern is identical to that which occurs when the same types of head movements are made in the free fall phase of parabolic maneuvers. It appears that space motion sickness is the consequence of prolonged exposure to a nonterrestrial force background rather than of exposure to free fall per se. Author

A86-36317
CENTRAL SEROUS RETINOPATHY (CHOROIDOPATHY) IN PILOTS
M. GROSS, P. FROOM, Y. TENDLER, M. MISHORI, and J. RIBAK (Israel Air Force, Aeromedical Center, Ramat Gan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 457, 458. refs

The clinical charts of pilots in the Israeli Airforce were reviewed retrospectively for evidence of central serous retinopathy (CSR). There were 14 pilots with documented CSR identified, with an incidence of 1.3 per 1000 per year. Of six pilots who had recurrent attacks, five had a decrease of visual acuity during the initial attack to at least 20/30 in the affected eye. On the other hand, in those with visual acuity no worse than 20/25, only one of seven had recurrent attacks (p less than 0.05). It is concluded that CSR is a common condition in pilots, and that visual acuity during the initial attack can predict those who will have recurrent disease. Author

A86-36495
A STUDY OF THE EFFECT OF ULTRASOUND ON THE ANTIGENIC ACTIVITY OF HUMAN ERYTHROCYTES [ISSLEDOVANIE DEISTVIIA UL'TRAZVUKA NA ANTIGENNUIU AKTIVNOST' ERITROTSITOV CHELOVEKA]
L. A. PIRUZIAN, R. G. MAEV, M. M. NISNEVICH, M. M. KOIFMAN, and Z. N. KORNEVA (AN SSSR, Institut Khimicheskoi Fiziki, Moscow, USSR) Biofizika (ISSN 0006-3029), vol. 31, Mar.-Apr. 1986, p. 269-273. In Russiah. refs

A86-36526
HEART AND RESPIRATION RATES DURING A MENTAL TASK PERFORMED WITH VARYING DEGREES OF SUCCESS [CHASTOTA SERDECHNYKH SOKRASHCHENII I DYKHANIIA PRI RAZLICHNOI USPESHNOSTI VYPOLNENIIA UMSTVENNOI RABOTY]
T. M. SINITSINA (Leningradskii Nauchno-Issledovatel'skii Institut Neirokhirurgii, Leningrad, USSR) and R. P. CHEKURDA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 199-203. In Russian. refs

The effect of the degree of achievement in performing a mental assignment on the rates of respiration (RR) and heart contraction (HCR) was studied in 49 men and women by continually measuring the rates before, during, and after a mental test that required strict attention. The increases in RR and HCR were seen to parallel the degree of nervous tension and were highest among the poorest achievers. Correlation between the changes in the RR and HCR varied with the level of achievement: among the best achievers, the correlation ratio was in the range of 0.62-0.65, while in the lowest achievers there was no correlation. The results support the report of Zagriadskii and Sulimo-Samuillo (1982) that the optimal regulation of physiological functions facilitates ability to adapt to stressful situations. I.S.

A86-36528
THE MECHANISMS OF MUSCLE ACTIVITY REGULATION IN HUMANS DEPENDING ON BIORHYTHM TYPE [MEKHANIZMY REGULIATSII MYSHECHNOI DEIATEL'NOSTI V ZAVISIMOSTI OT BIORITMOLOGICHESKOGO TIPA CHELOVEKA]
S. G. KRIVOSHCHEKOV, G. M. DIVERT, and G. M. DOMAKHINA (Institut Fiziologii, Novosibirsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 258-262. In Russian. refs

The functional states of the central nervous system (CNS) and of the muscles were assessed in the morning and evening hours in subjects of three biorhythm types: the evening and the morning types, and the arrhythmics. The subjective work capacity (SWC) levels were determined from questionnaires. In all subjects, the SWC levels correlated well with the functional muscle activity determined from electromyographic indices, being maximal in the morning for the morning types, and in the evening for the evening types. In subjects of the morning type, the maximal and minimal values of the SWC also coincided with the highs and lows of the sensorimotor reaction speeds (i.e., with the functional state of the CNS), whereas in the evening types and in the arrhythmics such synchrony was absent. It is suggested that, in the morning types, the psychophysiologic synchrony is psychogenically determined by the CNS regulatory mechanism, which is disturbed in subjects of the evening type due to socially acquired changes in the activity rhythms. I.S.

A86-36529
SEASONAL DYNAMICS OF CIRCADIAN RHYTHMS OF OXYGEN CONSUMPTION AND HEAT PRODUCTION IN YOUTHS IN SIBERIAN CONDITIONS [SEZONNAIA DINAMIKA SUTOCHNYKH RITMOV POTREBLENIIA KISLORODA I TEPLOPRODUKTSII KISLORODA I TEPLOPRODUKTSII U PODROSTKOV V USLOVIIAKH SIBIRI]
N. D. NEDBAEVA (Institut Fiziologii, Novosibirsk, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 263-268. In Russian. refs

A86-36530
THE DYNAMICS OF SYSTEMIC FUNCTIONAL ORGANIZATION DURING ADAPTATION TO WORK IN EXTREME ENVIRONMENTS [DINAMIKA SISTEMNOI ORGANIZATSII FUNKTSII PRI ADAPTATSII K TRUDY V EKSTREMAL'NYKH USLOVIIAKH]
V. P. GREBNIAK and E. I. CHUPRINA (Donetskii Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Donetsk, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 269-276. In Russian. refs

Dynamics of systemic organization were studied in miners working under stressful environmental conditions, using the maximal correlation method of Terentiev (1959). The correlation matrix included parameters of age, length of professional service, and the professionally significant stress indices of the cardiovascular, respiratory, and circulatory systems. It was found that the correlation coefficients between the systemic physiological indices were most informative in subjects with 2-5 yrs of stressful work experience. Whereas the number of intersystemic shifts was maximal in subjects with 2-5 years experience, the intrasystemic shifts continued to increase with the years of service. I.S.

A86-36531
EVALUATING THE FUNCTIONAL STATUS OF OPERATORS USING INDICES OF MENTAL WORK CAPACITY [OTSENKA FUNKTSIONAL'NOGO SOSTOIANIIA OPERATOROV PO POKAZATELIAM UMSTVENNOI RABOTOSPOSOBNOSTI]
A. IU. BUROV (Kievskii Nauchno-Issledovatel'skii Institut Gigieny Truda i Profzabolevanii, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 281-288. In Russian. refs

Results of psychophysiological tests were used to establish correlators between mental work capacity and vegetative indices. The latent time in answering questions and the number of correct answers in the test were correlated with the ECG R-R

cardiointervals, the propagating time of the pulse waves (RPs), and the cutaneogalvanic reaction recorded during the test. The character of vegetative activity was found to correlate with the capacity to do mental work, especially with the work productivity. The period between 1 and 15 min in the recorded spectra was found to be most useful for the psychophysiological assessment. I.S.

A86-36532
SUBSTANTIATION OF PHYSIOLOGICAL CRITERIA FOR ASSESSING THE FUNCTIONAL STATUS OF THE HUMAN BODY IN HIGH-TEMPERATURE ENVIRONMENTS [OBOSNOVANIE FIZIOLOGICHESKIKH KRITERIEV DLIA OTSENKI FUNKTSIONAL'NOGO SOSTOIANIIA ORGANIZMA CHELOVEKA V USLOVIIAKH VYSOKIKH TEMPERATUR OKRUZHAIUSHCHEI SREDY]
A. N. AZHAEV Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 289-295. In Russian. refs

The value of the parameters of water and ion exchange and thermal exchange processes and of cardiovascular and respiratory systems for assessing the ability of the human body for thermal adaptation was studied. Male subjects were exposed to temperatures in the 20-80 C range for various times. While the informational value of all the parameters studied depended on the degree of overheating, the parameters derived from the measurements of skin and rectal body temperatures were found to be useful in the assessment of the human functional state under all degrees of overheating. Under the conditions causing the first degree of overheating, the heat exchange rate, the loss of body weight, heat loss through perspiration, and the mean of skin temperature were found to be the most significant correlants. In the second and third overheating degrees, rectal temperature changes, and the parameters of the cardiovascular and respiratory functions were most informative. I.S.

A86-36533
MANGANESE METABOLISM IN HEALTHY HUMANS DURING DIFFERENT TIMES OF THE YEAR [OBMEN MARGANTSA U ZDOROVYKH LIUDEI V RAZNOE VREMIIA GODA]
V. V. NASOLODIN and V. IA. RUSIN (Iaroslavskii Gosudarstvennyi Universitet, Yaroslavl, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 322-327. In Russian. refs

A86-36534
DYNAMICS OF THE ULTRASLOW BIOELECTRIC BRAIN ACTIVITY DURING THE PERFORMANCE OF CERTAIN PARTS OF OPERATIONAL ACTIVITY [DINAMIKA SVERKHMEDLENNOI BIOELEKTRICHESKOI AKTIVNOSTI MOZGA PRI REALIZATSII NEKOTORYKH ELEMENTOV OPERATORSKOI DEIATEL'NOSTI]
V. I. PRIMAKOV (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 328, 329. In Russian. refs

The degree of correlation between the ultraslow electrical brain activity with the functional state of an operator was investigated in subjects before and during the performance of various psychomotor and psychophysiologic tests. Changes in the amplitude and period characteristics of the zeta and tau waves were recorded during videomotor acuity tests and during tests evaluating subjects' attention. The characteristics of both zeta and tau activities changed differently during various phases of the operators' activity, demonstrating that the ultraslow brain activity can serve as an objective index for evaluating the degree of strain imposed on the regulatory brain structures that control and rearrange the activity levels in other systems of the body. I.S.

A86-36535
HUMAN ADAPTATION TO ANTAGONISTIC ENVIRONMENTAL FACTORS [ADAPTATSIIA CHELOVEKA K VOZDEISTVIIU ANTAGONISTICHESKIKH FAKTOROV SREDY]
V. A. ASTASHIN (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 330, 331. In Russian.

The effect of alternate exposures to low and high temperatures on human physiological reactions was studied in subjects exposed for five days to a regimen of 2 hrs at 16 C and 40 percent humidity, followed by 2 hrs at 49 C and 25 percent humidity. The rate of heart contractions, minute respiratory volume, rectal temperature changes in the sensorimotor reactions, cardiovascular response to physical load, and leukocyte counts were monitored at all stages of the experiment. In addition, the effect of adaptation on the thermoregulatory reactions was studied by subjecting some subjects to an additional test consisting of an exposure to 10 C at rest, followed by exercise at 49 C, conducted before and after the 5-day adaptation experiment. The complex patterns of changes in the physiological reactions of thermoregulation suggest the existence of two simultaneous processes of adaptation. I.S.

A86-37077
MUSCLE ATROPHY DURING SPACE FLIGHT - RESEARCH NEEDS AND OPPORTUNITIES
G. J. HERBISON (Thomas Jefferson Hospital, Philadelphia, PA) and J. M. TALBOT (Federation of American Societies for Experimental Biology, Life Sciences Research Office, Bethesda, MD) Physiologist (ISSN 0031-9376), vol. 28, Dec. 1985, p. 520-527. refs

Data on muscle biology and atrophy including causes, preventions, and rehabilitation are examined. Muscle atrophy related to actual and simulated space flight is studied; potential causes of space-flight muscle atrophy and countermeasures are studied. The objectives of NASA's current and planned research programs for space-related muscle atrophy are discussed. I.F.

N86-25111 National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 284)
May 1986 59 p
(NASA-SP-7011(284); NAS 1.21:7011(284)) Avail: NTIS HC A04 CSCL 06E

This bibliography lists 148 reports, articles, and other documents introduced into the NASA scientific and technical information system in April 1986. Author

N86-25112# Norwegian Defence Research Establishment, Kjeller. Forsvarets Forskningsinstitutt.
CHEMICALLY INDUCED DAMAGE TO THE HIPPOCAMPAL FORMATION
L. U. NAALSUND May 1986 91 p refs Sponsored in cooperation with the Royal Norwegian Council for Scientific and Industrial Research
(NDRE/PUBL-86/1002; ISSN-0800-4412) Avail: NTIS HC A05/MF A01

Degeneration of the hippocampal formation after trimethyltin (TMT) administration can be detected at an early phase by electric recordings from intrahippocampal electrodes. The anatomical distribution of the damage can be studied by histochemistry, and was shown to include the CA3 and CA4 subfields in the initial period and spreading to the CA1 after a complete destruction of the pyramidal cells in CA3 and CA4. The degeneration was shown to be specific for glutamergic neurons in the hippocampus, high affinity uptake of 3H glutamate being the only biochemical parameter which was changed. In vitro TMT increased the efflux of 3H glutamate from synaptosomes in the resting state, but had no effect on the efflux of 3H GABA. The synaptosomal reuptake of transmitter and receptor binding were both inhibited in the presence of TMT. In relation to reports on TMT as an anion conductor, the effect of changes in extracellular Cl(-) concentration on transmitter release was investigated. A reduction in the external

Cl(-) concentration was shown to have a much larger effect on the efflux of transmitter from glutamergic than from GABAergic synaptosomes. The sensitivity of the hippocampal electric activity to changes after exposure to toxic compounds was utilized for the investigation of a put active neurotoxic effect of long term exposure to low levels of toluene. An increased synchronization together with an increased frequency in the theta waves was observed during the first period of toluene exposure. The later phase was characterized by a gradually increasing disruption in regular waves and a reduction in the theta frequency. No improvements regarding regularity or frequency was seen during one month after termination of exposure, indicating that irreversible changes in neuronal functions have occurred. Author

N86-25113# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
A REVIEW OF THE PILOT BACKACHE PROBLEM IN THE CH113 LABRADOR HELICOPTER
A. BEACH Dec. 1985 26 p refs
(AD-A164011; DCIEM-85-R-49) Avail: NTIS HC A03/MF A01 CSCL 06S

In response to an Unsatisfactory Condition Report, complaints of back pain and discomfort induced by the pilots' seat of the CH113 Labrador helicopter were investigated. Several published reports dealing with the problem are reviewed and summarized in terms of incidence and prevalence rates, frequency, intensity, duration, location and time to pain onset. A questionnaire was developed and distributed to CH113 Labrador helicopter pilots in order to determine how closely the backache characteristics of the pilots match the characteristics reported by the general population. In addition, an evaluation of the size and shape of the Labrador seat was conducted and results were compared to published seat design guidelines and recommendations. Questionnaire results indicate that the typical backache reported by Labrador pilots is similar to the backache reported by other helicopter pilots. It is usually a dull pain in the lumbar area, most often experienced during flight and usually lasting after the mission ends. Subjective results also indicate that backache may be negatively correlated with regular exercise. Based on the symptoms identified in the questionnaire and the causes identified by other investigators, design principles for an improved seat incorporating an inflatable lumbar support and a more effective load bearing seat cushion were established. GRA

N86-25114# Toronto Univ., Downsview (Ontario). Defence and Civil Inst. of Environmental Medicine.
REVIEW OF MODIFIED HEMOGLOBIN SOLUTIONS FOR USE AS TEMPORARY BLOOD SUBSTITUTES
L. J. J. HRONOWSKI Dec. 1985 31 p refs
(AD-A164210; DCIEM-85-R-51) Avail: NTIS HC A03/MF A01 CSCL 06O

The present review will focus on blood substitutes using hemoglobin solutions as oxygen carriers. It will review the more recent developments and discuss the limitations and problems associated with the present hemoglobin preparations. This will be covered under the headings of purification of hemoglobin, modification and polymerization of the hemoglobin molecule and the biological activities of the hemoglobin solutions. Polymerization of hemoglobin is currently the only means of obtaining a physiological concentration of hemoglobin which is iso-oncotic with plasma. Polymerized pyridoxylated hemoglobin is currently the most widely used example of such an iso-oncotic hemoglobin solution having normal oxygen carrying capacity. Such solutions, however, are heterogeneous polydispersed mixtures of widely different molecular weight. In addition, these solutions still contain about 20% of the unpolymerized tetramer which is rapidly eliminated in the urine. These solutions also have oxygen affinities which are considerably higher than those found in the red blood cells. In addition to their effectiveness, the hemoglobin solutions must be shown to be safe. Safety studies on the polymerized and modified hemoglobin solutions must address issues such as hematological responses, vasoactive ef fects, effect on the reticuloendothelial system, effect on immunocompetence, antigenicity, nephrotoxicity, and iron toxicity. GRA

N86-25115# California Univ., Irvine.
MULTIDISCIPLINARY STUDIES ON EXCITATORY AMINO ACIDS AS TRANSMITTERS IN THE BRAIN Final Report, 27 Sep. 1982 - 26 Sep. 1985
C. W. COTMAN 7 Nov. 1985 9 p refs
(Contract DAAG29-82-K-0194)
(AD-A164258; ARO-19016.14-LS) Avail: NTIS HC A02/MF A01 CSCL 06A

The major goal has been to analyze the excitatory amino acid receptors in the brain, particularly those mediating responses by glutamate and aspartate. Acidic amino acids, principally L-glutamate and L-aspartate, appear to be the major excitatory transmitters in the CNS. As such, these molecules may be the most abundant CNS neurotransmitter class. L-Glutamate shows many of the characteristics of other neurotransmitters. Glutamate is present in high levels in the brain and is relatively enriched in select neurons. Transmitter glutamate is supplied to nerve terminals by synthesis, primarily via the enzyme glutaminase, and by high affinity uptake. The mechanism for transmitter inactivation in the synapse appears to be the rapid removal by a high affinity uptake system. Both endogenous L-glutamate and L-glutamate derived from exogenously supplied radiolabelled precursors exhibit Ca(++)-dependent release upon depolarization. A transport system responsible for the loading of L-glutamate into synaptic vesicles has also been identified. Excitatory amino acids act on a variety of distinct receptor types, and there are now available many compounds which can mimic or block synaptic activity at excitatory amino acid using synapses. Our approach has involved the analysis of these receptors in isolated synaptic membranes and their further definition and anatomical localization via light microscopic autoradiography. GRA

N86-25116# Indiana Univ., Bloomington. Dept. of Chemistry.
ISOTOPIC STUDY OF THE INHALATION TOXICOLOGY OF OXIDANTS
J. M. HAYES and J. SANTROCK Jun. 1985 200 p Sponsored in part by Health Effects Research Lab.
(PB86-109485; EPA-600/1-85-013) Avail: NTIS HC A09/MF A01 CSCL 06T

The purpose was to develop novel methods to investigate the biological fate of inhaled ozone and other oxygen-containing pollutants in animal and human tissues using the heavy isotope of oxygen, oxygen-18 (18O). Methods were developed which facilitated the conversion of tissue oxygen to CO2 and the subsequent trapping of the CO2 so that it could be subjected to isotope-ratio mass spectrometry. The ratios of the various masses of evolved CO2 were used to calculate the 18O content of the original tissues, thus enabling the detection of isotopic enrichments as small as 0.4%. The above procedures were performed by modification of a commercially available elemental analyzer to include effluent columns and trapping devices, development of oxygen isotopic standards, and derivation of mathematical models for correction of blank and memory effects originating during sample pyrolysis. These techniques were applied with success to the determination of the biological fate of inhaled ozone, and to the measurement of tissue oxidation induced by a model peroxidation initiator, carbon tetrachloride. Author

N86-25117# Federal Communications Commission, Washington, D. C. Office of Science and Technology.
EVALUATING COMPLIANCE WITH FCC (FEDERAL COMMUNICATIONS COMMISSION) SPECIFIED GUIDELINES FOR HUMAN EXPOSURE TO RADIOFREQUENCY RADIATION
R. F. CLEVELAND Oct. 1985 58 p
(PB86-127081; OST/BULL-65) Avail: NTIS HC A04/MF A01 CSCL 06R

The technical bulletin provides information and guidelines for use in evaluating compliance with FCC-specified environmental rules dealing with human exposure to radiofrequency (RF) radiation. It provides assistance in determining whether an FCC-regulated

facility might create a significant environmental effect due to human exposure to levels of RF radiation in excess of specified radiation protection guides. Emphasis is placed on exposure from broadcast facilities. However, the bulletin also contains information relevant to certain other RF-emitting sources. GRA

N86-25978*# Good Samaritan Hospital and Medical Center, Portland, Oreg. Dept. of Neuro-otology.
NORMAL AND ABNORMAL HUMAN VESTIBULAR OCULAR FUNCTION Final Technical Report
R. J. PETERKA and F. O. BLACK May 1986 66 p refs
(Contract NCC9-8)
(NASA-CR-176820; NAS 1.26:176820) Avail: NTIS HC A04/MF A01 CSCL 06P

The major motivation of this research is to understand the role the vestibular system plays in sensorimotor interactions which result in spatial disorientation and motion sickness. A second goal was to explore the range of abnormality as it is reflected in quantitative measures of vestibular reflex responses. The results of a study of vestibular reflex measurements in normal subjects and preliminary results in abnormal subjects are presented in this report. Statistical methods were used to define the range of normal responses, and determine age related changes in function.
Author

N86-25979# Army Research Inst. of Environmental Medicine, Natick, Mass.
AEROBIC CAPACITY AND CORONARY RISK FACTORS IN A MIDDLE-AGED ARMY POPULATION AD-A163998 HC A02/MF A01
J. F. PATTON, J. A. VOGEL, J. L. BEDNEK, JR., D. ALEXANDER, and R. ALBRIGHT Jan. 1986 23 p refs
(Contract USRIEM-M-10/86)
(AD-A163998) Avail: NTIS HC A02/MF A01 CSCL 06N

The purpose of this study was to assess the relationship between coronary risk factors (CRF) and aerobic capacity measured by the direct determination of oxygen uptake during maximal exercise testing. Subjects comprised 295 male Army personnel (40 to 53 years of age) who underwent multiple serial screening procedures to include a medical and physical evaluation, calculation of a Framingham risk factor index (RI) and a graded treadmill exercise test (GXT) with the determination of peak oxygen uptake (pVO sub 2). CRF included resting systolic (SBP) and diastolic (DBP) blood pressures, total cholesterol (TC), HDL-C, triglycerides (TRIG), fasting blood sugar (FBS), smoking history, resting ECG, and percent body fat (% BF). The results, although cross sectional, imply that a high level of aerobic capacity is associated with lower coronary risk factors. GRA

N86-25980# Army Research Inst. of Environmental Medicine, Natick, Mass.
FITNESS AND ACTIVITY ASSESSMENTS AMONG US ARMY POPULATIONS: IMPLICATIONS FOR NCHS GENERAL POPULATION SURVEYS
J. A. VOGEL Jan. 1986 66 p refs
(AD-A164060; USARIEM-M-11/86) Avail: NTIS HC A04/MF A01 CSCL 06N

The military forces of this country represent the largest population for which physical fitness is routinely assessed. Field measures of aerobic power, muscle strength and muscular endurance, along with body weight, are measured twice yearly in the U.S. Army through age 60. Field measures are defined as those conducted by army units without the aid of equipment or indoor facilities. The purpose of these periodic fitness evaluations is both as an indicator of the adequacy of training to meet performance goals as well as a motivator to the individual to train and improve their fitness level. In addition to these periodic field measures, extensive population surveys of laboratory-measured fitness and activity assessment have been made in a wide variety of Army units over the past ten years by the Exercise Physiology Division, US Army Research Institute of Environmental Medicine. These assessments have been part of an ongoing research program to study factors influencing fitness in the Army. This chapter presents a description of the survey methods and sample data from both approaches. GRA

N86-25981# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN ANALYSIS OF POTENTIAL PREDICTIVE PARAMETERS OF MOTION SICKNESS USING A COMPUTERIZED BIOPHYSICAL DATA ACQUISITION SYSTEM M.S. Thesis
N. R. JARVIS and C. T. UYEDA, JR. Dec. 1985 254 p refs
(AD-A164099; AFIT/GSO/ENG/85D-1) Avail: NTIS HC A12/MF A01 CSCL 06E

A computerized biophysical data acquisition system was refined and used to collect biophysical data on human volunteer subjects to examine effects of coriolis induced motion sickness. Redesigned sensors to measure electrical cardiac activity, cardiac chest rebound, abdominal/thoracic respiration, peripheral pulse blood volume, facial pulse blood volume, skin temperature, gastric/intestinal activity, nystagmus, and brain wave activity were incorporated with commercially available sensors for galvanic skin response, heart rate, and blood pressure to thoroughly measure the subject's vital signs. Subjects were rotated in a multiaxis motion chair and data collected for later analysis. Data were collected on paper strip chart recorders in parallel with a MASSCOMP MC500 minicomputer. The MASSCOMP data acquisition system software was refined with better documentation to allow data replay.
GRA

N86-25982# Kentucky Univ., Lexington. Research Lab.
ULTRASONIC QUANTIFICATION OF BLOOD VOLUME REDISTRIBUTION UNDER HYPERGRAVITY Final Report, Feb. 1981 - Sep. 1985
P. K. BHAGAT and D. R. BROWN 15 Jan. 1986 87 p refs
(Contract N00014-85-K-0325)
(AD-A164379) Avail: NTIS HC A05/MF A01 CSCL 06S

In the operation of high performance aircraft, operational crews are often subject to high sustained + or - GZ acceleration. The response of the human cardiovascular system to these acceleration forces has been the object of considerable research. Numerous techniques have been used to measure important parameters of cardiovascular function; however, plethysmographic measurements of blood volume shifts have not been possible during exposure to hypergravity because of unavoidable tissue deformation. Such measurements have added significantly to understanding of the cardiovascular response to postural shifts and to zero-g. A multi-channel instrument has been developed which employs multiple ultrasonic depth measurements to determine the volume of blood contained in the various compartments of the circulation during exposure to hypergravity on a centrifuge. These volume measurements can be used to study the time course and quantity of blood shifts produced by exposure to selected acceleration profiles and physiological manipulations, including anti-G suit inflation. The data obtained should provide improved understanding of basic cardiovascular physiology and of the relative effectiveness of various anti-G devices. GRA

N86-25983# California Univ., Irvine. Dept. of Community and Environmental Medicine.
COMPARATIVE BIOCHEMISTRY AND METABOLISM. PART 2: NAPHTHALENE LUNG TOXICITY Annual Report, Jun. - Dec. 1984
P. R. RICHIERI and A. R. BUCKPITT Nov. 1985 38 p
(Contract F33615-80-C-0512)
(AD-A163144; AAMRL-TR-85-069) Avail: NTIS HC A03/MF A01 CSCL 06T

The studies reported in this document were to quantitatively examine the diffusion of naphthalene oxide and reactive metabolites form naphthalene in suspensions of isolated mouse hepatocytes and to determine whether the efflux of these metabolites was dependent upon the depletion of intracellular glutathione. The efflux of naphthalene oxide from intact hepatocytes was monitored in incubations containing 3H-glutathione (this tripeptide will not cross the intact hepatocellular membrane) and was based on the measurement of 3H-labelled glutathione adducts. Between 17 and

35% of the total naphthalene oxide formed during the metabolism of naphthalene in the cell was trapped on the exterior of the cell with 3H-glutathione. The fraction of epoxide exiting the hepatocytes as a percentage of the total amount formed did not vary with increasing naphthalene concentrations between 0.005 and 1.5 mM. These data in conjunction with the studies showing that incubation of hepatocytes with naphthalene at concentrations of 0.05 mM or greater caused a significant depletion of intracellular glutathione, suggested that the quantity of naphthalene oxide diffusing as a percentage of the total formed was not dependent upon the intracellular glutathione status. In contrast, the ration of extracellular vs *i* ntracellular covalent binding was dependent on the concentration of naphthalene in the incubation. GRA

N86-25984# California Univ., Irvine, Dayton, Ohio.
ACUTE TOXICITY STUDIES ON 2 AIR FORCE HYDRAULIC FLUIDS (MLO 82-233 AND MLO 82-585) Technical Report, Apr. 1983 - Mar. 1984
E. R. KINKEAD, J. R. HOTRON, C. L. GAWORSKI, and R. A. SALOMON Nov. 1985 22 p
(Contract F33615-80-C-0512)
(AD-A163174; AAMRL-TR-85-070) Avail: NTIS HC A02/MF A01 CSCL 06T

This report describes results of investigations into the acute toxic properties of two operational Air Force hydraulic fluids, MLO 82-233 and MLO 82-585. Various routes of administration were investigated including inhalation, dermal, and oral in rats, guinea pigs, rabbits, and chickens. No acute toxicity occurred in rats with either hydraulic fluid as a results of oral or inhalation exposure at the maximum concentration tested. Dermal exposure of rabbits resulted in no mortalities with either hydraulic fluid. One hydraulic fluid, MLO 82-585, was found to be a moderate skin irritant but neither fluid caused ocular irritation nor did they produce a sensitization response in guinea pigs. Neither fluid would be considered to be a delayed neurotoxin. Author (GRA)

N86-25985# California Univ., Irvine, Dayton, Ohio.
THE EXPERIMENTAL DETERMINATION OF SAFE ATMOSPHERIC EXPOSURE CONCENTRATIONS OF JP-10 JET FUEL Final Technical Report, Jun. 1978 - Jun. 1984
C. C. HAUN, E. R. KINKEAD, E. H. VERNOT, J. D. MACEWEN, and R. H. BRUNER Nov. 1985 25 p
(Contract F33615-76-C-5005; F33615-80-C-0512)
(AD-A163179; AAMRL-TR-85-072) Avail: NTIS HC A02/MF A01 CSCL 06T

Four animal species were exposed for 1 year to 100 ppm (556 cu mg/m) JP-10 to determine its long-term toxic and oncogenic effects. Rats, mice, and hamsters were maintained for 1 year postexposure, while dogs were held for 5 years postexposure. Mean body weights of exposed hamsters and male rats were lower than controls during exposure. Weight recovery occurred in hamsters, but not in male rats during postexposure phase of the study. Significant JP-10 exposure related effects were renal tubular nephrosis together with an increase in benign and malignant renal cell tumors in male rats. Author (GRA)

N86-25986# Los Alamos National Lab., N. Mex.
TOXICOLOGICAL STUDY OF NTO
J. E. LONDON and D. M. SMITH Sep. 1985 8 p refs
(Contract W-7405-ENG-36)
(DE86-003296; LA-10533=MS) Avail: NTIS HC A02/MF A01

The acute oral LD50 values for NTO for mice and rats are greater than 5 g/kg. According to classical guidelines, the test material would be considered only slightly toxic or practically nontoxic in both species. Skin application studies with NTO in rabbits demonstrated that it was mildly irritating cutaneously. With the scoring scheme, the rabbit eye test was considered negative; however, transient conjunctival and corneal irritation did result from the NTO application in several animals and one developed a chronic anterior uveitis. The material did not induce sensitization in the intradermal guinea pig assay. DOE

N86-25987# National Center for Health Services Research and Health Care Technology Assessment, Rockville, Md.
CARDIOKYMOGRAPHY
E. FEIGENBAUM 1985 9 p refs
(PB86-133790; NCHSR-85-127; REPT-10) Avail: NTIS HC A02/MF A01 CSCL 06L

Cardiokymography (CKG) is a non-invasive test to detect stress induced motion abnormalities of the anterior left ventricular wall of the heart for coronary artery disease (CAD). CKG involves translation of heart wall motion into a variable electrical signal that is recorded in graphic form. It may be affected by chest wall motion, systolic rotation of the ventricle, or patient movement. The tracing is a summation of cardio-thoracic movement in the area under the trancuducer. The utility of CKG in detecting CAD remains equivocal. Reassessment of CKG has disclosed that adequate scientific data are lacking with respect to the diagnostic effectiveness of this technology. At the present time cardiokymorgraphy continues to be considered investigational, when used as a method of diagnosing ischemic heart disease. GRA

N86-25988# National Academy of Sciences - National Research Council, Houston, Tex.
EMERGENT TECHNIQUES FOR ASSESSMENT OF VISUAL PERFORMANCE Final Report
Jun. 1985 77 p refs
(Contract N00014-80-C-0159)
(PB86-144755) Avail: NTIS HC A05/MF A01 CSCL 06P

Psychophysical research has revealed in recent years that traditional measures of visual acuity and visual field only partially characterize the information processes of the human observer. A survey of recent psychophysical research that has the potential for broadening conventional assessment of visual function is provided. Areas of practice to which such psychophyaical research techniques might be applied, are identified. GRA

N86-25989# Texas Univ. Health Science Center, Houston. School of Public Health.
HEALTH EFFECTS OF AMBIENT OZONE EXPOSURE IN VIGOROUSLY EXERCISING ADULTS
B. J. SELWYN, T. H. STOCK, D. E. JENKINS, D. J. KOTCHMAR, and R. S. CHAPMAN Jan. 1986 21 p refs Sponsored by Health Effects Research Lab. Prepared in cooperation with Baylor College of Medicine, Houston, Tex.
(Contract EPA-CR-807108)
(PB86-156940; EPA-600/D-86-033) Avail: NTIS HC A02/MF A01 CSCL 06E

The purpose of the analysis was to examine the association of changes in ambient ozone concentrations with changes in the pulmonary function (PFT) of healty adults after exercising vigorously outdoors. During May-October, 1981, 24 community residents (men and women) ran three miles twice a week some time between 4:30 and 6:30 P.M. at a high school track near Houston, Texas. An air monitoring trailer stood beside the track and monitored environmental variables continuously. The continuously measured environmental variables in this analysis (ozone, temperature, and relative humidity) were averaged over 15 minute intervals. Standard forced expiratory maneuvers were performed before and after each run. Exercise exertion was standardized. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-33776
HUMAN FACTORS SOCIETY, ANNUAL MEETING, 29TH, BALTIMORE, MD, SEPTEMBER 29-OCTOBER 3, 1985, PROCEEDINGS. VOLUMES 1 & 2
R. W. SWEZEY, ED. Meeting supported by Carlow Associates, Inc., Army, U.S. Nuclear Regulatory Commission, et al. Santa Monica, CA, Human Factors Society, 1985. Vol. 1, 655 p.; vol. 2, 550 p. For individual items see A86-33777 to A86-33830.

Papers are presented on vigilance mechanisms; information-processing approaches to the study of human-computer interaction; human factors in telecommunications; assessing the effects of individual differences on mental and physical workload; computers for training, instruction, and information retrieval; display simplification, visual search, and decluttering; and expert/knowledge-based systems. Topics discussed include vision, information scanning, and retrieval; human factors in accident analysis; managing organizational and product design changes; visual displays and VDT usage; industrial ergonomics; industrial safety; the objectives for human performance and research in military command and control; space and teleoperation; and habitability in constrained/constraining environments. Consideration is given to automation; the use of event-related brain potentials in measurement of attention, performance, and workload; maintenance and simulation training; visual performance and color displays; attention and decision making, human factors in space; and future training technologies. I.F.

A86-33777
AUTOMATIC AND CONTROLLED PROCESSING APPROACH TO INTERPRETING VIGILANCE PERFORMANCE
A. D. FISK (South Carolina, University, Columbia) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 14-18. refs

The Fisk and Schneider (1981) data on predicting vigilance performance based on automatic and controlled processing are examined. Controlled processing is defined as serial, limited by short-term memory, under direct control of the individual, modifies long-term memory, and requires little practice; automatic processing is the opposite of controlled. The data reveal that vigilance decrement is reduced if the observer is properly trained and uses automatic processing to detect the target stimuli, and controlled processing is the locus of vigilance effect. The reliability of automatic processing is evaluated by studying the effects of various stressors on automatic and controlled processes. It is observed that automatic processing is unaffected by heat, alcohol, and high mental workloads; however, controlled processing is limited. It is noted that performance is controlled by the processing mode not by factors such as task complexity or stage of processing. I.F.

A86-33778
INFORMATION PROCESSING IN VIGILANCE PERFORMANCE - COMPLEXITY REVISITED
J. S. WARM, W. N. DEMBER (Cincinnati, University, OH), T. M. LANZETTA (IBM Corp., Armonk, NY), J. C. BOWERS, and R. J. LYSAGHT IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 19-23. refs

Several experiments are described showing that the vigilance decrement can be reversed or retarded by a suitable level of complexity in symbolic functions needed for critical signal detection. This effect is most likely based upon motivational rather than learning factors and is dependent upon the selection of a complex task that is no more capacity demanding than a simple one. Author

A86-33782
THE INTERFERING EFFECTS OF PROCESSING CODE ON VISUAL MEMORY
B. P. GOETTL (Illinois, University, Champaign) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 66-70. refs
(Contract N00014-79-C-0658)

The possibility of reducing task interference in complex aviation environments by taking advantage of the verbal-spatial short term memory dichotomy is explored in a dual-task paradigm. Eighteen subjects performed verbal and spatial retention memory tasks concurrently with intervening verbal and spatial cognitive tasks. Both number and processing code of the intervening tasks were manipulated. Support was found for code-specific interference such that concurrently performed tasks of the same code disrupted performance more than concurrent tasks of different codes. In addition spatial memory was found to be more fragile than verbal memory. Implications of the findings to mental workload reduction include task scheduling, presentation format, and assignment. Author

A86-33783* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ASSESSING SUBJECTIVE WORKLOAD ASSESSMENT - A COMPARISON OF SWAT AND THE NASA-BIPOLAR METHODS
M. A. VIDULICH and P. S. TSANG (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 71-75. refs

The Subjective Workload Assessment Technique (SWAT) and the NASA weighted-bipolar method used for evaluating subjective workload assessment are compared. The application of these methods to the rating of single- and dual-task trials of tracking and spatial transformation is described. The methods used to collect the ratings for the SWAT and bipolar technique are examined. Analysis of the transformation-tracking data reveal that the two assessment techniques produce similar results and both measure the differences in task difficulty. The positive and negative characteristics of each technique are analyzed. I.F.

A86-33784* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TO SPEAK OR NOT TO SPEAK - A MULTIPLE RESOURCE PERSPECTIVE
P. S. TSANG, E. J. HARTZELL (NASA, Ames Research Center, Moffett Field, CA), and R. A. ROTHSCHILD (San Jose State University, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 76-80. refs

The desirability of employing speech response in a dynamic dual task situation was discussed from a multiple resource perspective. A secondary task technique was employed to examine the time-sharing performance of five dual tasks with various degrees of resource overlap according to the structure-specific resource model of Wickens (1980). The primary task was a visual/manual tracking task which required spatial processing. The secondary task was either another tracking task or a spatial transformation task with one of four input (visual or auditory) and output (manual or speech) configurations. The results show that the dual task performance was best when the primary tracking task was paired with the visual/speech transformation task. This finding was explained by an interaction of the stimulus-central processing-response compatibility of the transformation task and the degree of resource competition between the time-shared tasks. Implications on the utility of speech response were discussed. Author

A86-33788
AGE-DEPENDENT CHANGES IN INFORMATION PROCESSING ABILITIES BETWEEN 20 AND 60 YEARS
R. BRAUNE, C. D. WICKENS, D. STRAYER, and A. F. STOKES (Illinois, University, Savoy) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 226-230. refs
(Contract N00014-83-K-0747)

Information processing performance in single- and dual-task configurations was examined across 60 subjects between the ages of 20 and 60. The objective was to investigate the general slowing trend observed with increasing chronological age more closely. The results supported this general slowing trend which appears to be more pronounced for complex stimulus materials. However, age did not interact with dual-task loading. Examination of the evoked brain potential data under speed and accuracy instructions suggested that most of the slowing was attributed to response processes rather than those of perception and memory. Furthermore, older subjects were more conservative in placing their response criterion, and suffered a smaller loss when placed under speed stress. Author

A86-33792* Search Technology, Inc., Norcross, Ga.
AN EXPERIMENTAL APPROACH TO VALIDATING A THEORY OF HUMAN ERROR IN COMPLEX SYSTEMS
N. M. MORRIS and W. B. ROUSE (Search Technology, Inc., Norcross, GA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 333-337. refs
(Contract NAS2-12048)

The problem of 'human error' is pervasive in engineering systems in which the human is involved. In contrast to the common engineering approach of dealing with error probabilistically, the present research seeks to alleviate problems associated with error by gaining a greater understanding of causes and contributing factors from a human information processing perspective. The general approach involves identifying conditions which are hypothesized to contribute to errors, and experimentally creating the conditions in order to verify the hypotheses. The conceptual framework which serves as the basis for this research is discussed briefly, followed by a description of upcoming research. Finally, the potential relevance of this research to design, training, and aiding issues is discussed. Author

A86-33794* Old Dominion Univ., Norfolk, Va.
EYE-SCAN BEHAVIOR IN A FLIGHT SIMULATION TASK AS A FUNCTION OF LEVEL OF TRAINING
J. R. COMSTOCK, JR., G. D. COATES, and R. H. KIRBY (Old Dominion University, Norfolk, VA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 391-395.
(Contract NAG1-451)

The present study explored eye-scan behavior as a function of level of subject training. Oculometric (eye-scan) measures were recorded from each of ten subjects during training trials on a CRT-based flight simulation task. The task developed for the study incorporated subtasks representative of specific activities performed by pilots, but which could be performed at asymptotic levels within relatively short periods of training. Changes in eye-scan behavior were examined as initially untrained subjects developed skill in the task. Eye-scan predictors of performance on the task were found. Examination of eye-scan in proximity to selected task events revealed differences in the distribution of looks at the instruments as a function of level of training. Author

A86-33796
LEARNING AND PERFORMANCE IN AN AIR REFUELING PART-TASK TRAINER - PRELIMINARY DATA ANALYSIS
J. E. STEWART, II (USAF, Human Resources Laboratory, Williams AFB, AZ) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 408-411. refs

A86-33800
HELICOPTER CREW EVALUATIONS ON THE EFFECTS OF VIBRATION ON PERFORMANCE
R. P. BATEMAN and R. P. WHITE, JR. (Systems Research Laboratories, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 550-553. Navy-supported research. refs

The relationship between aircraft vibration levels, fatigue, and performance is analyzed. Twelve experienced helicopter crew members ranked nine helicopters based on vibration levels and their fatigue levels were evaluated; no correlation between vibration characteristics and the onset of fatigue is observed. The effects of vibration on helicopter operations are examined. It is noted that high workloads and boredom cause fatigue and inhibit performance. I.F.

A86-33804* Technion - Israel Inst. of Tech., Haifa.
THE PSYCHOPHYSICS OF WORKLOAD - A SECOND LOOK AT THE RELATIONSHIP BETWEEN SUBJECTIVE MEASURES AND PERFORMANCE
D. GOPHER, N. CHILLAG, and N. ARZI (Technion - Israel Institute of Technology, Haifa) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 640-644.
(Contract NAGW-494)

Load estimates based upon subjective and performance indices were compared for subjects performing size matching and letter typing tasks under 6 levels of priorities, in single and dual task conditions. Each half of the group used a different task as reference in their subjective judgement. The results are interpreted to indicate that subjective measures are especially sensitive to voluntary allocation of attention and to the load on working memory. Association with performance is expected whenever these two factors are main determinants of performance efficiency, otherwise the two are likely to dissociate. Author

A86-33806
ASSESSMENT OF TASK PROFICIENCY IN AIR FORCE OJT
R. E. WARM (Applied Science Associates, Inc., Valencia, PA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 740-744.

An On-the-Job Training (OJT) task proficiency assessment system was developed and tried out in the Air Force OJT environment. The task evaluation form system includes development procedures which when applied to a specific task allow subject matter experts to generate evaluation instruments. The resulting instruments, called task evaluation forms, accurately and completely depict the critical aspects of task performance. The task evaluation forms can be used by OJT supervisors to detect errors in task performance and derive and scores and pass/fail decisions which reflect observed performance. Author

A86-33807* Toronto Univ. (Ontario).
AN INVESTIGATION OF THE 'VON RESTORFF' PHENOMENON IN POST-TEST WORKLOAD RATINGS
D. C. THORNTON (Toronto, University, Canada) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 760-764. refs
(Contract NAGW-429)

The von Restorff effect in post-task ratings of task difficulty is examined. Nine subjects performed a hovercraft simulation task which combined elements of skill-based tracking and rule- and knowledge-based process control for five days of one hour sessions. The effects of isolated increases in workload on rating of task performance, and on the number of command errors and river band hits are analyzed. It is observed that the position of the workload increase affects the number of bank hits and command errors. The data reveal that factors not directly related to the task performance influence subjective rating, and post-task ratings of workload are biased. I.F.

A86-33808* Illinois Univ., Savoy.
THE EFFECT OF VARYING TASK DIFFICULTY ON SUBJECTIVE WORKLOAD
Y.-Y. YEH, C. D. WICKENS (Illinois, University, Savoy), and S. G. HART (NASA, Ames Research Center, Moffett Field, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 765-769.

The effect of different difficulty distribution patterns on subjective workload, and the presence of a primacy/recency effect in subjective ratings are examined. Eight subjects performed the perceptual central processing required for response selection and manual target acquisition for response execution. The reaction time, movement time, and the percent of correct pattern matching and arithmetic equations are analyzed. The data reveal that subjective rating is unaffected by different task difficulty and no primacy/recency effects are observed in subjective ratings. It is concluded that subjective workload reflects the experience of an ongoing integration process. I.F.

A86-33809
TRAINING CHARACTERISTICS OF THE CRITERION TASK SET WORKLOAD ASSESSMENT BATTERY
R. E. SCHLEGEL (Oklahoma, University, Norman) and C. A. SHINGLEDECKER (Ergometrics Technology, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 770-773. refs
(Contract F49620-82-C-0035)

An evaluation of the Criterion Task Set was performed to determine the training requirements for the various tasks. Twenty subjects were divided into four groups. One group trained on all nine tasks in the battery. The other three groups trained on different three-task subsets. All subjects trained for two hours per day on five consecutive days. Response time, accuracy and subjective workload measures were obtained for each trial. The required number of trials for stable performance ranged from two to six with a mode of five. Slight improvements were observed on some tasks after eight to ten trials. Performance by the group trained on all nine tasks was equivalent on half of the tasks and worse on the other half. Subjective workload ratings were highly correlated with the actual performance scores. Author

A86-33816* Georgia Inst. of Tech., Atlanta.
RULE-BASED ANALYSIS OF PILOT DECISIONS
C. M. LEWIS (Georgia Institute of Technology, Atlanta) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 907-911. refs
(Contract NAG2-123)

The application of the rule identification technique to the analysis of human performance data is proposed. The relation between the language and identifiable consistencies is discussed. The advantages of production system models for the description of complex human behavior are studied. The use of a Monte Carlo significance testing procedure to assure the validity of the rule identification is examined. An example of the rule-based analysis of Palmer's (1983) data is presented. I.F.

A86-33818
ANTICIPATORY ADJUSTMENTS DURING A WARNING INTERVAL - CORTICAL NEGATIVITY AND PERCEPTUAL SENSITIVITY
T. F. SANQUIST (Ford Aerospace and Communications Corp., Sunnyvale, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 958-961. Navy-supported research. refs

Cortical negative afterwaves were recorded while subjects performed a warned signal detection task. Warning intervals of 500, 1200 and 1900 msec, and immediate and delayed responses were employed as experimental conditions. Detection sensitivity was best at the 1200 msec warning interval, which coincided with maximum cortical negativity. The response requirement manipulation had no effect on detection performance or brain wave amplitude. The results are interpreted as indicating an arousal based allocation of processing resources, indexed by cortical negativity. Author

A86-33819
THE USE OF BRAIN EVOKED RESPONSE IN A CRITICAL EVENT DETECTION TASK
G. F. WILSON, S. L. WARD, and R. L. HANN (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 962-965. refs

Brain evoked potentials (EP) were used to study subject responses to 'critical events' (CEs) which were part of a series of stimuli. Both reaction times (RT) and EPs were influenced by the appearance of the CE. Longer RTs and a large late positive component of the EP were associated with the trials containing the CE stimuli. Intermediate RTs and late positve components of the EPs were found in a condition in which the stimulus preceding the CE gave information about the following CE and was also similar in appearance. While this is a laboratory test, it is similar in many ways to actual situations confronted by human factors specialists. EPs appear, then, to be useful tools in the system design and evaluation process. Author

A86-33820
EVENT-RELATED BRAIN POTENTIALS AND RESOURCE ALLOCATION - FROM DUAL-TASK DECREMENTS TO DUAL-TASK INTEGRALITY
A. F. KRAMER and C. D. WICKENS (Illinois, University, Champaign) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 966-970. refs

The use of event-related brain potentials (ERP) in the study of mental workload and resource allocation is discussed. A series of studies are reviewed which, taken together, suggest that the P300 component of the ERP provides a reliable measure of the perceptual/central processing demands of a task. Furthermore, the use of P300 in the assessment of mental workload offers the advantage of not requiring an overt response, thereby eliminating the possibility of secondary task intrusion into primary task performance. The concept of dual-task integrality is introduced and the resource demands of integral task pairs are inferred from measures of P300 amplitude. The finding are discussed in terms of resource models of mental workload. Author

A86-33821
EVENT-RELATED BRAIN POTENTIALS AND INTERMODAL DIVIDED ATTENTION
R. PARASURAMAN (Catholic University of America, Washington, DC) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 971-975. refs

Recorded event-related brain potentials (ERPs) are analyzed in order to study attention allocation to visual and auditory channels under high-information load. Ten subjects between 19-25 years monitored an audiovisual display of intermittent 2-degree circles presented centrally and 1000-Hz tones presented binaurally. The relationship between efficiency of target detection in the visual and auditory channel is examined with the performance operating characteristic analysis; a tradeoff in processing between the two channels is detected. The data reveal that intermodality divided attention affects both modality-specific and modality-nonspecific ERP components in practiced subjects under high-information load conditions. The application of the data to models of processing resources and the evaluation of mental workload is described.
I.F.

A86-33822* Maryland Univ., Baltimore.
PROCESSING INFERENCES DERIVED FROM EVENT-RELATED POTENTIAL MEASURES IN A MONITORING TASK
R. L. HORST, R. C. MUNSON (ARD Corp., Columbia, MD), and D. S. RUCHKIN (Maryland, University, Baltimore) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 976-980. refs
(Contract NAS1-17576)

Event-related potentials (ERPs) were recorded from the scalp of subjects as they monitored changing digital readouts for values that went 'out-of-bounds'. Workload was manipulated by varying the number of readouts that were monitored concurrently. The ERPs elicited by changes in the readouts showed long latency positivities that increased in amplitude, not only with the number of readouts monitored, but also with the number of monitored readouts that were 'in danger' of going out-of-bounds. No effects were found due to the number of nonmonitored readouts 'in danger'. This evidence indicates that subjects (1) selectively attended to the monitored readouts and (2) processed the monitored readouts differently as the readouts approached the out-of-bounds levels to which an overt response was required.
Author

A86-33825* Illinois Univ., Savoy.
A COMPARISON OF OPERATOR PERFORMANCE IN MANUAL AND AUTOMATED VERSIONS OF A DYNAMIC DECISION-MAKING TASK
C. D. WICKENS, Y.-Y. YEH, R. B. FULD, and S. HODEL (Illinois, University, Savoy) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1089-1091. refs
(Contract NAG2-308)

The study of operator performance in manual and automated versions of dynamic decision tasks is proposed. The two microcomputer paradigms of simple and complex, dynamic scheduling tasks are described. Error detection accuracy and latency of assignment, and fault detection and correction for the two tasks are to be analyzed.
I.F.

A86-33826
VOICE AND MANUAL CONTROL IN DUAL TASK SITUATIONS
C. D. WICKENS (Illinois, University, Savoy), J. ZENYUH (USAF, Wright Aeronautical Laboratories, Wright-Patterson AFB, OH), V. CULP (USAF, Mather AFB, CA), and W. MARSHAK (U.S. Air Force Academy, Colorado Springs, CO) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1093-1097. refs

This paper describes various influences of compatibility and task-resource competition that affect time-sharing a verbal and a manual control task, with either manual or voice control. In the reported experiment subjects performed a two-dimensional discrete tracking task concurrently with a Sternberg memory search task. Each task was controlled either by voice, the left hand, or the right hand. The major influence on performance was the advantage for conditions in which the Sternberg task was voice-controlled and tracking was manually controlled. Voice-controlled tracking produced incompatibility, while bimanual control produced resource competition. Smaller, but still reliable effects were observed for hemispherically-compatible assignments (left-handed tracking).
Author

A86-33827
EYE AND HEAD RESPONSE TO AN ATTENTION CUE IN A DUAL TASK PARADIGM
G. L. CALHOUN (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH), C. J. ARBAK (Systems Research Laboratories, Inc., Dayton, OH), and W. P. JANSON (Synergy, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1125-1129. refs
(Contract F33615-82-C-0511)

Eight subjects were used to characterize eye and head movements in response to a cue to refixate. The subjects' tasks were to complete a centrally located task and identify vertically peripheral targets. Eye and head reaction time as well as conventional performance measures were recorded. The results showed that the eye and head movement pattern obtained with vertically displaced targets was not identical with those previously obtained with horizontally displaced targets. The results also indicated that eye reaction time, with hard tracking, increases the farther a target is vertically displaced from the centrally located task and head reaction time decreases with the presence of a verbal cue prior to target presentation. Manual reaction time did not, however, decrease with a cue. These results suggest that such unobtrusive measures may be valuable in the design of attention cueing systems.
Author

A86-33830
FUTURE DIRECTIONS FOR COST EFFECTIVE AIR FORCE AIRCREW TRAINING - MANAGED TECHNOLOGY AND THE TRAINING SYSTEM
R. J. HEINTZMAN and A. J. COURTICE (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1146-1150.

The use of simulation in Air Force flight training is studied. The need for modular simulation hardware, simulator data bases, view display devices, texture systems, and airborne simulation, in order to improve military flight simulation, is discussed. The development of a data base which will provide cost effective management of training programs is examined.
I.F.

A86-33983#
A HIERARCHICAL MODEL OF PILOT'S PROCEDURAL BEHAVIOR FOR COCKPIT WORKLOAD ANALYSIS
K. TANAKA and K. MATSUMOTO (National Aerospace Laboratory, Chofu, Japan) (Japan Society for Aeronautical and Space Sciences, Aircraft Symposium, 22nd, Tokyo, Japan, Nov. 27-29, 1984) Japan Society for Aeronautical and Space Sciences, Transactions (ISSN 0549-3811), vol. 28, Feb. 1986, p. 230-239. refs

A dynamic model of human pilot behavior during aircraft operation is presented for the purpose of estimating pilot workload in an automated cockpit environment. On the basis of Rasmussen's hierarchical structure of human behavior (1983), the model is composed of three levels: knowledge-based behavior, rule-based behavior, and skill-based behavior. The model is constructed by taking advantages of LISP, and has the following specific features: goal-oriented and scenario-driven hierarchical structure; sequencer-type procedural behavior; and a group of functions of skill-based behavior. Simulation results of an aircraft operation driven by a sample scenario demonstrate that the model can reproduce estimations of crew's business corresponding to their subjective business, and show the possibility that the model should provide us with a tool for dynamic analysis of pilot behavior. Author

A86-35286#
TRAINING OF COSMONAUTS AND EXPERIENCE DURING SPACE FLIGHT
R. SHARMA (Indian Air Force, New Delhi, India) Aviation Medicine, vol. 29, June 1985, p. 13-17.

This paper presents the experiences of the Indian cosmonaut from the selection stage to the extensive training programs and his observations during the launch, space orbit and successful return to earth. Special refrence is made to the effectiveness of yogic exercise in cosmonaut training. Author

A86-35289#
SOME ASPECTS OF YOGIC EXERCISES DURING SPACE FLIGHT
J. M. WADHAWAN (Air Force Hospital, Jorhat, India), M. B. DIKSHIT (Indian Air Force, Institute of Aviation Medicine, Bangalore, India), and P. C. CHATTERJEE (Indian Air Force, New Delhi, India) Aviation Medicine, vol. 29, June 1985, p. 31-37.

The paper discusses some aspects of yogic exercises conducted during the joint Indo-Soviet manned space program. The ground and inflight yogic exercises conducted during the experiment have been discussed with some of their psycho-physiological principles and basis for the selection of these exercises. The experiment was aimed to determine the role of yogic exercises in minimizing the adverse effects of weightlessness during the space flight from April 3, 1984 to April 11, 1984. Preliminary results suggest that yogic exercises had definite beneficial effects on the Indian cosmonaut who was the subject of this study. The positive effects on the motor system were shown by appreciable recovery of EMG potentials following infligh yogic exercises which was found declining initially due to reflex muscular hypotonia. The Indian cosmonaut also maintained a state of psycho-physiological well being during the space flight. Author

A86-35427* Essex Corp., Orlando, Fla.
AUTOMATED PORTABLE TEST SYSTEM (APTS) - A PERFORMANCE ENVELOPE ASSESSMENT TOOL
R. S. KENNEDY (Essex Corp., Orlando, FL), W. P. DUNLAP (Tulane University, New Orleans, LA), M. B. JONES (Pennsylvania State University, Hershey), R. L. WILKES (Casper College, NY), and A. C. BITTNER, JR. (U.S. Navy, Naval Biodynamics Laboratory, New Orleans, LA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 3-13. refs
(Contract NSF BSN-84-60765; NAS9-16982)
(SAE PAPER 851775)

The reliability and stability of microcomputer-based psychological tests are evaluated. The hardware, test programs, and system control of the Automated Portable Test System, which assesses human performance and subjective status, are described. Subjects were administered 11 pen-and-pencil and microcomputer-based tests for 10 sessions. The data reveal that nine of the 10 tests stabilized by the third administration; inertial correlations were high and consistent. It is noted that the microcomputer-based tests display good psychometric properties in terms of differential stability and reliability. I.F.

A86-35428
ASSESSING THE HUMAN PERFORMANCE ENVELOPE - A BRIEF GUIDE
A. C. BITTNER, JR., M. M. HARBESON (U.S. Navy, Naval Biodynamics Laboratory, New Orleans, LA), R. S. KENNEDY (Essex Corp., Orlando, FL), and N. C. LUNDY (Lundy and Associates, Bay St. Louis, MS) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 15-25. refs
(SAE PAPER 851776)

The procedures for assessing the human performance envelope are reviewed. The selection of the performance measures which provide the greatest potential utility and are easily interpretable is discussed. The use of the proper assessment methodology in multiple- and single-subject experiments is examined. I.F.

A86-35429
MENTAL FITNESS FOR DUTY AND CONTROL OF AROUSAL STATE
H. NAGANO (Japan Air Lines Co., Ltd., Tokyo) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 27-29.
(SAE PAPER 851778)

Human factors in flight operations are studied. The two aspects essential for flight management, 'think ahead' and 'fly the aircraft', are described. The need for the pilot to control arousal level in order to maintain the reliability of the brain and perform required procedures is examined. The relationship between human factors and automation is analyzed. The development of improved training procedures for airline pilots in Japan is discussed. I.F.

A86-35430
INTERACTIVE COMPUTER-BASED FLIGHT TRAINING
J. M. CHILDS (BDM Corp., McLean, VA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 33-38.
(SAE PAPER 851991)

This paper describes a recently developed interactive computer-based flight training program. The program is to be used in conjunction with flight simulator training for the U.S. Coast Guard HU-25A (Falcon) aircraft. Reduced costs and enhanced pilot proficiency are expected to accrue relative to the current program. Author

A86-35434* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
ASTRONAUT CREW PERFORMANCE - RECENT SPACE EXPERIENCE
P. A. SANTY and J. L. LEWIS (NASA, Johnson Space Center, Houston, TX) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 71-74. refs
(SAE PAPER 851802)

The performance and productivity of astronauts in space are studied. The effects of the space and spacecraft environments, man/machine interaction, work-rest cycles, and psychological factors on man's performance in space are examined. The objectives of the Gemini, Apollo, and Skylab programs and the performance data collected on these missions are analyzed. I.F.

A86-35441
PILOT SPEECH PERFORMANCE WHILE TALKING TO A SPEECH RECOGNIZER AND FLYING A COMPETITIVE HELICOPTER PURSUIT TASK
C. A. SIMPSON (Psycho-Linguistic Research Associates, Menlo Park, CA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 133-141. Army-supported research. refs
(SAE PAPER 851779)

The performance of pilots and connected-word speaker dependent speech recognizers under task loading conditions are evaluated. Ten male pilots performed recognizer template enrollment, pilot message categorization training, and warning message classification and gunner/scout pursuit tasks; the experimental conditions and procedures are described. Pilot response accuracy, pilot-machine system response accuracy, recognizer-computer performance, and recognition algorithm performance are examined. Individual performance differences among pilots and the effects of task loading on recognition accuracy are analyzed. The isolated-word recognition algorithm data of Simpson (1985) and the connected-word recognition algorithm data are compared. The data reveal that the isolated-word algorithm is inadequate for aircraft cockpit use; however, the connected-word algorithm is applicable for noncritical flight functions. I.F.

A86-35445
A CASE FOR REALISTIC TRAINING
J. S. CLAUZEL (Douglas Aircraft Co., Long Beach, CA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 175, 176.
(SAE PAPER 851915)

The development of a realistic program for training flight crews is discussed. The use of instructional techniques, equipment, and simulation in crew training is examined. It is noted that the application of the training information to emergency situations could reduce the number of aircraft accidents. I.F.

A86-35446* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
REALISTIC TRAINING FOR EFFECTIVE CREW PERFORMANCE
H. C. FOUSHEE (NASA, Ames Research Center, Moffett Field, CA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 177-181.
(SAE PAPER 851916)

Evaluation of incident and accident statistics reveals that most problems occur not because of a lack of proficiency in pilot training, but because of the inability to coordinate skills into effective courses of action. Line-Oriented Flight Training (LOFT) and Cockpit Resource Management (CRM) programs provide training which will develop both individual crew member skills, as well as those associated with effective group function. A study conducted by NASA at the request of the U.S. Congress supports the argument for training that enhances crew performance in addition to providing individual technical skills, and is described in detail. Author

A86-35447
THE CASE FOR TRAINING FOR THE POTENTIALLY CATASTROPHIC SITUATION
G. S. MILLS (McDonnell Aircraft Co., St. Louis, MO) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 183-187.
(SAE PAPER 851917)

The need to train pilots to handle unusual emergency situations is examined. The use of simulators to train pilots for potentially catastrophic situations is discussed. Examples of situations in which pilots require further training, such as blown tires on take off and landing, wet/icy runways in strong crosswinds, aircraft stalls and spins, maximum lift performance of aircraft, and yawing moment characteristics, are presented. I.F.

A86-35667* Systems Technology, Inc., Mountain View, Calif.
ASSESSMENT OF SIMULATION FIDELITY USING MEASUREMENTS OF PILOTING TECHNIQUE IN FLIGHT. II
S. W. FERGUSON, W. F. CLEMENT (Systems Technology, Inc., Mountain View, CA), R. H. HOH (Systems Technology, Inc., Hawthorne, CA), and W. B. CLEVELAND (NASA, Ames Research Center, Moffett Field, CA) AHS, Annual Forum and Technology Display, 41st, Fort Worth, TX, May 15-17, 1985, Paper. 24 p. Army-sponsored research. refs
(Contract NAS2-11098; NAS2-11731)

Two components of the Vertical Motion Simulator (presently being used to assess the fidelity of UH-60A simulation) are evaluated: (1) the dash/quickstop Nap-of-the-earth (NOE) piloting task, and (2) the bop-up task. Data from these two flight test experiments are presented which provide information on the effect of reduced visual field of view, variation in scene content and texture, and the affect of pure time delay in the closed-loop pilot response. In comparison with task performance results obtained in flight tests, the results from the simulation indicate that the pilot's NOE task performance in the simulator is significantly degraded. K.K.

A86-36175
AN INTEGRATED DISPLAY FOR VERTICAL AND TRANSLATIONAL FLIGHT EIGHT FACTORS AFFECTING PILOT PERFORMANCE
J. S. TATRO (Bell Helicopter Textron, Fort Worth, TX) and S. N. ROSCOE (New Mexico State University, Las Cruces) Human Factors (ISSN 0018-7208), vol. 28, Feb. 1986, p. 101-120. refs
(Contract N00014-81-K-0439)

As part of an overall research program to optimize both forward-looking and downward-looking tactical situation displays for all-weather instrument flight in vertical takeoff and landing (VTOL) aircraft, an integrated horizontal situation display was developed for both vertical and translational flight. This paper covers the developed and initial experimentation of the downward-looking portion of the overall display and control system. The effects of eight factors on pilot performance were tested, and a multiple regression model of VTOL pilot performance as a function of those eight factors was derived for each of three dependent performance measures. Factors having important effects were position error magnification, control order, prediction time, control gain, tracking mode, and several of their interactions. Author

A86-36560
CONTROLLING OF PILOT WORK CAPACITY BY PSYCHOSOMATIC SELF-REGULATION TECHNIQUES [UPRAVLENIE RABOTOSPOSOBNOST'IU LETCHIKA METODOM PSIKHOSOMATICHESKOI SAMOREGULIATSII]
S. G. MELNIK and A. V. SHAKULA Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Feb. 1986, p. 37-39. In Russian. refs

The effect of psychosomatic self-regulation training on the work capacity and the psychophysiological state of pilots was investigated. The training method consisted of eight 20-min-long recorded group instructions, followed by two weeks of relaxation training sessions. The results of the training efficiency were evaluated by measuring the postflight heat contraction rates and blood pressures and by comparing the in-flight work efficiency and piloting techniques in trained and untrained pilots assigned to long-time flights or to frequently repeated destroyer-flight missions. The pilots trained in self-regulation exhibited smaller increases in rates of heart contractions and in blood pressures and higher levels of work capacity and piloting technique. Moreover, in the second year after the training in self-regulation, the time losses due to illness were lower by a factor of 3 in comparison with the control group. I.S.

A86-36947
VISUAL CUE DOMINANCE HIERARCHIES - IMPLICATIONS FOR SIMULATOR DESIGN
R. WARREN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) and G. E. RICCIO (Systems Research Laboratories, Inc., Dayton, OH) IN: Flight simulation/simulators; Proceedings of the Aerospace Technology Conference and Exposition, Long Beach, CA, October 14-17, 1985 . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 61-75. refs (SAE PAPER 851946)

Fidelity requirements of flight simulators are addressed by proposing a classification based on informational, perceptual, experiential, and action implications. Fidelity assessment is argued to begin with cue inventory definition and empirical research. Cue evaluation is complex due to the presence of multiple cues for a single referent. A dominance hierarchy may emerge allowing little incidental learning to weak cues. An altitude holding experiment is reported to illustrate cue dominance effects. Other studies are discussed which also indicate possible non-optimum effects of using scenes with multiply redundant cues. Since certain flight situations may delete dominant cues, pilots need to be experienced using the weaker cues and this implies using simulators in reduced cue modes. Hence, maximum fidelity is not always desirable.
Author

N86-25118# Air Force Academy, Colo.
BEHAVIORAL CONSIDERATIONS FOR SPACE STATION DESIGN Final Report, Oct. 1984 - Dec. 1985
F. R. WOOD and K. O. DUNIVIN Jan. 1986 69 p refs
(AD-A163478; USAFA-TR-86-3) Avail: NTIS HC A04/MF A01 CSCL 05J

Flight crews are more than just the sum of the members' individual technical skills. They are dynamic and constantly changing systems of interacting units. The critical factor in this system is the interaction process. Factors which affect this interaction process are design considerations critical to the successful operation of the human system in space. Future space missions will be longer and will involve more routine tasks. Crews will be larger and more heterogeneous. These conditions make proper consideration of group dynamics principles imperative. Formal design of future space missions should consider critical design factors which promote the group process. The real change to current NASA mission design suggested by this report is that greater consideration be given to the informal processes characteristic of the human system. Consideration of these factors will pay large dividends in terms of human system performance and neglect of these factors will incur costs. GRA

N86-25119# Colorado Univ., Boulder. Center for Research on Judgment and Policy.
GENERALIZING OVER CONDITIONS BY COMBINING THE MULTITRAIT MULTIMETHOD MATRIX AND THE REPRESENTATIVE DESIGN OF EXPERIMENTS
K. R. HAMMOND, R. M. HAMM, and J. GRASSIA Jan. 1986 64 p refs
(Contract N00014-81-C-0591; BRSG-RR-07013-14)
(AD-A163685; CRJP-255A) Avail: NTIS HC A04/MF A01 CSCL 05J

Analytical methods should be substituted for the current largely intuitive methods for generalizing results over conditions. Toward that end we present a methodology that combines Campbell and Fiske's (1959) multitrait multimethod matrix and Brunswik's (1956) representative design of experiments. A description of a study of expert judgement and a critique of current practices illustrate the methodology. GRA

N86-25120# Stanford Univ., Calif.
STATISTICAL INFERENCES IN CROSS-LAGGED PANEL STUDIES
L. S. MAYER Nov. 1985 51 p refs
(Contract DAAG29-82-K-0156)
(AD-A163892; TR-15; ARO-19065.16-MA) Avail: NTIS HC A04/MF A01 CSCL 12A

Cross-lagged panel studies are statistical studies in which two or more variables are measured for a large number of subjects at each of several waves or points in time. The variables divide naturally into two sets and the primary purpose of the analysis is to estimate and test the cross-effects between the two sets. Such studies are found in the mainstreams of social behavioral and business research. One approach to this analysis is to express the cross-effects as parameters in regression equations and then use regression methods to estimate and test the parameters. We contribute to this approach by extending the regression model to a multivariate model that captures the correlation between the dependent variables. We develop estimators for the parameters of this model and hypothesis tests for assessing the presence of effects and cross-effects. We demonstrate our results with the analysis of a cross-lagged panel study of the perceptions and attitudes of patients toward a health maintenance organization.
Author (GRA)

N86-25990# Minnesota Univ., Minneapolis. Computerized Adaptive Testing Lab.
PROCEEDINGS OF THE ITEM RESPONSE THEORY AND COMPUTERIZED ADAPTIVE TESTING CONFERENCE Final Report
D. J. WEISS Apr. 1985 382 p Conference held at Wayazata, Minn., 27-30 Jun. 1982
(Contract N00014-82-G-0061)
(AD-A163040) Avail: NTIS HC A17/MF A01 CSCL 05J

This report is the Proceedings of the 1982 Item Response Theory and Computerized Adaptive Testing Conference held July 27-30, 1982 at the Spring Hill Conference in Wayzata, Minnesota. These Proceedings include all papers presented at the conference and discussions of these papers by the scheduled discussants. The papers are organized into the following sessions: (1) Development in Latent Trait Theory; (2) Parameter Estimation; (3) Multidimensional Item Response Theory; (4) Estimating Parameters with the E-M Algorithm; (5) Unidimensionality and Robustness; (6) Adaptive and Sequential Testing; (7) Latent Trait Models forSpecial Applications; and (8) Applications of Computerized Adaptive Testing. GRA

N86-25991# Air Force Human Resources Lab., Brooks AFB, Tex.
THEORY-BASED COGNITIVE ASSESSMENT Interim Paper, Oct. 1984 - Sep. 1985
P. C. KYLLONEN Jan. 1986 35 p refs
(AD-A164083; AFHRL-TP-85-30) Avail: NTIS HC A03/MF A01 CSCL 05J

This paper reviews the theoretical foundations, current issues, and a number of recent studies in the area of cognitive ability assessment, with particular focus on personnel selection and classification applications. A brief review of the history of aptitude testing is provided, with particular emphasis on the cognitive psychology, along with the availability of modestly priced microcomputer systems, hold promise for improvements in ability assessment technology. Recent studies conducted at the Air Force Human Resources Laboratory as part of the Learning Abilities Measurement Program and similar projects are reported. The focus of these studies has been on determining (1) the utility of various cognitive tasks for providing meaningful information on individual cognitive skill levels, (2) whether such tasks tap abilities not measured by currently operational paper-and-pencil tests, and (3) how changes in processing efficiency can be analyzed. Cognitive diagnostic as well as selection-and-classification applications are discussed. GRA

N86-25992# Engineering Research Associates, Inc., Vienna, Va.
SCHEMA-BASED THEORY OF INFORMATION PRESENTATION FOR DISTRIBUTED DECISION MAKING Interim Report
D. F. NOBLE and J. A. TRUELOVE Aug. 1985 120 p refs
(Contract N00014-84-C-0484)
(AD-A163150; R-028-85) Avail: NTIS HC A06/MF A01 CSCL 05J

The Schema-Based Theory of Information Presentation for Distributed Decision Making describes a schema structure appropriate for understanding connections between the way that information is presented and its impact on distributed decision making. The theory suggests a process for determining how information should be presented so that consensus and coordination will be improved and decision conflicts will be reduced. The theory proposes that experienced decision makers select alternatives by mental processes that match the features of the current situation to features of reference situations for which possible alternatives are known to be appropriate. These reference situations may specify particular threat activities and dispositions, own Battle Group objectives, prescribed contingency plan action, and decision behavior of other decision makers to the group. Information presented according to the principles derived from the theory will encourage each decision maker to more fully consider the impact of each action on the objectives of other decision makers. Applying the principles requires that the general schema used by decision makers be determined prior to the time when particular situation-specific information is presented. Given this prior determination, the principles sugg est what emphasis needs to be given to specific features and feature relationships in the presentation of the current situation. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-33779
THE USE OF SIGNAL DETECTION THEORY IN RESEARCH ON HUMAN-COMPUTER INTERACTION
R. PARASURAMAN and G. WISDOM (Catholic University of America, Washington, DC) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 33-37. refs

The use of signal detection theory (SDT) in evaluating attentional and decision-making performance in the context of human-computer interaction is reviewed. SDT provides a means for distinguishing between accuracy and criterion setting in decision-making environments. This is useful in evaluating the effectiveness of the decision-making performance of an intelligent machine, a human user, or a human-machine system. SDT is also useful in deciding how best to allocate subtasks and functions in human-computer monitoring systems. Applications of SDT to the evaluation of rule bases in expert systems and the design of computer assistance in human-computer monitoring are discussed. Author

A86-33781
THERE'S A VOICE IN THE SKY - BUT CAN A PICTURE TELL YOU MORE?
C. P. ROBINSON (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH) and R. E. EBERTS (Purdue University, West Lafayette, IN) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 61-65. refs

A current trend in cockpit design is to incorporate synthesized speech to present secondary information. Multiple resource theories of information processing support this, but theories of stimulus-central processing-response compatibility suggest that spatial information presented visually may have some advantages over speech. An experiment was run comparing tracking and response performance when information was presented pictorially and by speech. Pictorial subjects responded quicker and improved more with learning than did speech subjects. More research on the spatial advantages of pictorial displays is needed before too many speech displays are incorporated into the cockpit. Author

A86-33785
ASSESSMENT OF SWAT ACCURACY
M. E. REVESMAN (BDM Corp., Albuquerque, NM) and S. M. ROKICKI (USAF, Operational Test and Evaluation Center, Kirtland AFB, NM) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 183-187.

Recently, the Subjective Workload Assessment Technique (SWAT) has become a popular tool for assessing mental workload. SWAT attempts to estimate an individual's internal representation of mental workload from a rank ordering of combinations of mental workload factors. This paper presents an experiment in which these internal values were simulated on a computer. Conjoint analysis was performed on rank orders produced from the internal values with and without noise added. Results indicated that conjoint analysis was able to accurately estimate the 'true' rankings and values, even when noise was present. In addition, linear regression was found to be a poor estimator of the 'true' values, while a simpler technique, rank summing, was found to be as accurate an estimator as conjoint analysis. Author

A86-33786
METHODS AND SYSTEMS FOR MEASURING HUMAN PERFORMANCE CAPABILITIES
C. A. SHINGLEDECKER, M. S. CRABTREE (Ergometrics Technology, Inc., Dayton, OH), and F. T. EGGEMEIER (Wright State University, Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 210-214. refs

Theoretical and experimental factors that affect the applicability of standardized human performance assessment techniques are analyzed. The Criterion Task Set in which a theoretical model of human performance is used as the primary factor in the selection of component tasks is described. The reliability and sensitivity of human performance assessment batteries are examined. The advantages the microcomputer provides to the implementation of task batteries are discussed. I.F.

A86-33787
WORKLOAD MEASUREMENT IN SYSTEM DESIGN AND EVALUATION
F. T. EGGEMEIER (Wright State University, Dayton, OH), C. A. SHINGLEDECKER, and M. S. CRABTREE (Ergometrics Technology, Inc., Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 215-219. refs
(Contract F33615-82-K-0522)

Because of its central role in system development, workload measurement has been extensively researched. These efforts have produced a variety of workload assessment techniques, many of which can be classified as either subjective, physiological, or behavioral measures. These categories of measures can vary along several dimensions that can be used as criteria in selection of a technique for a particular application. The proposed selection criteria include the sensitivity, diagnosticity, and intrusiveness associated with a technique. Different stages of system design can require techniques that differ on the noted dimensions. Since no technique is capable of meeting all of the applicable criteria, a comprehensive approach to workload assessment will require a battery of subjective, physiological, and behavioral measures. Further research dealing with comparative evaluation of the various assessment techniques along the noted dimensions will be required in order to refine workload metric selection criteria. Author

A86-33789
FEATURE POSITIVE CODING EFFECTS ON OBJECT LOCALIZATION
D. L. WILSON (Science Applications International Corp., Dayton, OH), R. K. BURNS (USAF, Aeronautical Systems Div., Wright-Patterson AFB, OH), and G. G. KUPERMAN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 292-296. refs

An investigation of feature positive information coding which included clutter level and display polarity as independent variables was conducted. Three dependent measures were considered: search time, designation time, and designation accuracy. Twelve subjects performed a target location/designation task under 72 combinations of the experimental variables. For search time, the main effects of feature coding and clutter level together with their interaction were found to be significant (p less than 0.01). For designation time, only the main effect of clutter was significant (p less than 0.05). No significant findings were identified for designation accuracy. Author

A86-33790* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DECLUTTERING METHODS FOR HIGH DENSITY COMPUTER-GENERATED GRAPHIC DISPLAYS
E. E. SCHULTZ, JR., D. A. NICHOLS, and P. S. CURRAN (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 300-303.

Several decluttering methods were compared with respect to the speed and accuracy of user performance which resulted. The presence of a map background was also manipulated. Partial removal of nonessential graphic features through symbol simplification was as effective a decluttering technique as was total removal of nonessential graphic features. The presence of a map background interacted with decluttering conditions when response time was the dependent measure. Results indicate that the effectiveness of decluttering methods depends upon the degree to which each method makes essential graphic information distinctive from nonessential information. Practical implications are discussed. Author

A86-33791
A PERIPHERAL INTEGRATED STATUS DISPLAY - IS IT REALLY GIVING THE 'BIG PICTURE' OR IS IT A MINISERIES?
D. B. BERINGER (Wisconsin, University, Madison) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 304-307. refs

Much effort has been directed towards the creation of effective integrated displays for vehicle or system control. These efforts have generally been aimed at 'primary' instruments or indices of system performance and only comparatively recently have secondary indices received similar attention. Each group of indices, however, has generally been kept separate, resulting in systems having multiple nonintegrated integrated displays. A method is proposed whereby these may be combined within a single instrument or 'integrated' integrated display. This method is based upon the use of spatial cues created by regular versus irregular polygons. A major question at issue is whether such a display created by regular versus irregular polygons. A major question at issue is whether such a display constitutes a single integrated shape or merely an assembly of subshapes that are serially scanned. Author

A86-33795
PRO-SWAT APPLIED TO ADVANCED HELICOPTER CREW STATION CONCEPTS
G. G. KUPERMAN (USAF, Aerospace Medical Research Laboratory, Wright-Patterson AFB, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 398-402. refs

The Subjective Workload Assessment Technique was applied projectively (Pro-SWAT) to the prediction of workload to be expected in a single-pilot, advanced scout/attack helicopter weapon system. A composite mission scenario was created. Five configurations of the pilot/vehicle interface were synthesized, each based on some form of a virtual panoramic display (VPD). They were assessed at each of six segments extracted from the mission scenario. An analysis of variance, with predicted workload as the dependent measure, found highly significant differences between both mission segments and VPD concepts (p less than 0.01). Author

A86-33797
THE SACCADIC EYE MOVEMENT CONTROL SYSTEM
J. HENDRICKSON (Old Dominion University, Norfolk, VA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 427-430. refs

This paper reports the results of an effort to construct a computer model of the saccadic eye movement control system.

The purpose of the system, the structure of the system, and measures of system performance were identified. A model of the system was constructed and a computer simulation of the model was developed and exercised. The performance of the computer model was then compared with the measured performance of the system and the validity of the model was determined. Author

A86-33798
SHADOW MASK DISPLAY VISIBILITY - HUMAN THRESHOLDS FOR PERCEPTION OF MISCONVERGENCE EFFECTS
O. K. HANSEN (HEDCON, Inc., Villa Park, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 1 . Santa Monica, CA, Human Factors Society, 1985, p. 431-435.

A psychophysical study was conducted to identify the acceptable limits of misregistration of the color vector beams in a 'delta gun' shadow mask display. The criteria for acceptability were the perceptual responses of sixteen male pilots who viewed the display and adjusted the beam convergence to achieve various visual effects. Results are discussed in terms of display image perception and engineering design standards. Author

A86-33803
A WORKLOAD ANALYSIS FOR STRATEGIC CONVENTIONAL STANDOFF CAPABILITY MISSIONS
G. G. KUPERMAN (USAF, Aerospace Medical Research Laboratories, Wright-Patterson AFB, OH) and D. L. WILSON (Science Applications International Corp., Dayton, OH) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 635-639. refs

This paper presents the methodology and supporting rationale for the investigation of operator workload in the context of an enhancement to an existing weapon system. The methodology is applicable early in the conceptual design process and forms the baseline data from which final design validation may be developed. The Subjective Workload Assessment Technique (SWAT), used projectively, forms the kernel of the methodology. A strategy for building part-task through full-mission simulations, at increasing levels of face and content validity, is presented in the context of the weapon system development process. Author

A86-33805
APPLICABILITY OF USING THE CAR-II MODEL IN DESIGN AND EVALUATION OF MULTIOPERATOR WORKSTATIONS WITH SHARED CONTROLS
S. J. MORRISSEY, B. E. HERRING (Auburn University, AL), and M. G. GENNETTI (Stanford University, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 698-701.

This study was done to show how a computerized workstation design program could be used to design and evaluate workstations having multiple operators with shared or common controls. To do this the Computerized Assessment of Reach program (CAR) was used to evaluate the cockpit of the OH-58A (Huey) helicopter. This same program was then used to demonstrate methods of cockpit redesign. Author

A86-33810
TIMEBASED ANALYSIS OF SIGNIFICANT COORDINATED OPERATIONS (TASCO) - A COCKPIT WORKLOAD ANALYSIS TECHNIQUE
M. G. ELLISON and B. B. ROBERTS (Computer Sciences Corp., Edwards AFB, CA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 774-778.

TASCO has been developed to provide a diagnostic tool to aid in avionics operation task structuring. The objective of the TASCO logic is to determine the optimum organization of cockpit activities considering task complexity and task execution time compared to estimated time available to perform the task set. The TASCO cockpit workload analysis technique measures and evaluates the relationships between pilot proficiency, experience, and weapon system complexity in order to reduce risk in task performance. Author

A86-33811
TELEOPERATION OF LEGGED VEHICLES - UNIQUE PROBLEMS ASSOCIATED WITH WALKING AND FOOT PLACEMENT
R. J. GERTH, D. B. BERINGER, and J. C. MUNDT (Wisconsin, University, Madison) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 834-838. refs

Teleoperation of legged walking vehicles poses some interesting problems in display and control design. Informational needs associated with individual foot placement when traversing rough terrain are explained. Problems faced in meeting those needs and vision, display, and control system options are presented. Future research is also described. Author

A86-33813* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HUMAN PRODUCTIVITY OF SPACE STATION
K. F. WILLSHIRE (NASA, Langley Research Center, Hampton, VA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 843-845.

The objectives of NASA's Space Station Human Productivity Program are examined. The design and functions of the Space Station are described. The effects of the interior architecture, crew support, crew activities, intravehicular activity (IVA) systems, and extravehicular/IVA interfaces on the productivity of the Space Station are investigated. It is estimated that crew productivity should be sustained for a 90-day tour at levels above 90 percent of the initial mission performance level. I.F.

A86-33817
AN AUTOMATED METHODOLOGY FOR CONDUCTING HUMAN FACTORS EVALUATIONS OF PROTECTIVE GARMENTS
H. GREGOIRE (Southern California, University, Los Angeles, CA), D. W. CALL, L. C. OMLIE (U.S. Navy, Naval AirTest Center, Patuxent River, MD), and R. J. SPICUZZA (Systems Research Laboratories, Inc., California, MD) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 916-919. Navy-supported research.

A86-33823
RESEARCH ON THE SPECIFICATION AND ACQUISITION OF MAINTENANCE TRAINING SIMULATORS IN THE U.S. AIR FORCE
R. J. CARROLL and J. A. FITZPATRICK (Applied Science Associates, Inc., Valencia, PA) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1012-1016. refs

A86-33828* Martin Marietta Corp., Denver, Colo.
CHARACTERIZATION OF GOOD TELEOPERATORS - WHAT APTITUDES, INTERESTS, AND EXPERIENCE CORRELATE WITH MEASURES OF TELEOPERATOR PERFORMANCE
J. P. YORCHAK, C. S. HARTLEY (Martin Marietta Corp., Space Operations Simulator Laboratory, Denver, CO), and E. HINMAN (NASA, Marshall Space Flight Center, Huntsville, AL) IN: Human Factors Society, Annual Meeting, 29th, Baltimore, MD, September 29-October 3, 1985, Proceedings. Volume 2 . Santa Monica, CA, Human Factors Society, 1985, p. 1135-1139. refs
(Contract NAS8-35184)

The use of aptitude tests and questionnaries to evaluate an individuals aptitude for teleoperation is studied. The Raven Progressive Matrices Test and Differential Aptitude Tests, and a 16-item questionnaire for assessing the subject's interests,

academic background, and previous experience are described. The Proto-Flight Manipulator Arm, cameras, console, hand controller, and task board utilized by the 17 engineers are examined. The correlation between aptitude scores and questionnaire responses, and operator performance is investigated. Multiple regression data reveal that the eight predictor variables are not individually significant for evaluating operator performance; however, the complete test battery is applicable for predicting 49 percent of subject variance on the criterion task. I.F.

A86-34923#
HELICOPTER FLIGHT CONTROL WITH ONE HAND
A. L. LIPPAY, M. KING, R. V. KRUK (CAE Electronics, Ltd., Montreal, Canada), and M. MORGAN (National Aeronautical Establishment, Ottawa, Canada) (CASI, Annual General Meeting, 32nd, Montreal, Canada, May 27, 1985) Canadian Aeronautics and Space Journal (ISSN 0008-2821), vol. 31, Dec. 1985, p. 335-345. refs

In a given control task, human error rate may increase in proportion to the number of control devices and mental transformations. A single device whose degrees of freedom coincide spatially with the principal task parameters, and whose dynamic characteristics provide a modicum of feedback representing the demands imposed on the system, should permit a reduction of the (human) control problem. A deflection-type side-arm controller developed in Montreal is described, which enables axis-by-axis or co-ordinated control in up to six degrees of freedom with one hand. The design minimizes unwanted inputs and cross-coupling between axes. Six-axis control was established in several spacecraft and manipulator simulations. A four-axis version has been installed in a research helicopter. Preliminary testing indicated good pilot acceptance, reduced training/familiarization requirements and - in some cases - significant improvement in control performance. A second generation engineering effort is currently in progress to produce high quality units for formal testing and eventual flight qualification. Author

A86-34957
ADVANCED MANIPULATOR SYSTEM ARCHITECTURAL REQUIREMENTS FOR SPACE STATION
P. KUMAR and S. SACHDEV (Spar Aerospace, Ltd., Remote Manipulator Systems Div., Toronto, Canada) IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 2-1 to 2-8.

Remote manipulator systems must be governed by concepts and requirements related to maintainability and autonomy for indefinite life. It is required that these systems provide operational autonomy resulting in operations independent of ground and machine autonomy resulting in routine tasks being performed by automated and expert system features. Moreover, these systems must be space maintainable. These requirements embody the lower tier requirements of automation, reliability, safety, fault tolerancing and artificial intelligence features. The requirement for manipulator mobility is discussed, and a Space Station era manipulator system is presented with function-allocation to various levels of control hierarchy and constituents of a system data base. K.K.

A86-34959* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
RECENT ADVANCEMENTS IN TELEPRESENCE TECHNOLOGY DEVELOPMENT
K. CORKER (Bolt Beranek and Newman, Inc., Cambridge, MA) and A. K. BEJCZY (California Institute of Technology, Jet Propulsion Laboratory, Pasadena) IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 2-15 to 2-22. refs

This paper describes recent developments at JPL aimed at enhancing the operator's awareness of the remote task he or she is controlling in space teleoperation. The first development is related to the use of force-reflecting or bilateral manual control in weightless condition. The second development is related to integrated graphics displays of force and torque information originating from a remote robot hand. The third development is related to a distributed computational system in teleoperation organized in two groups: one integrated with a remote robot arm and hand, and another integrated with the control station. This computational system carries out interactive automation functions. Author

A86-34971
EVOLUTIONARY PATHS FOR ARTIFICIAL INTELLIGENCE TECHNOLOGIES IN OPERATOR INTERACTIONS WITH SPACE STATION ROBOTS
R. A. HAMMOND, D. C. DORROUGH (Boeing Computer Services Co., Bellevue, WA), and D. P. MEYER (Boeing Aerospace Co., Seattle, WA) IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 7-14 to 7-20.

Two paths have been proposed for the evolution of technologies supporting human interfacing with robots aboard the NASA Space Station: (1) the use of teleoperators (so that human operators are in the control loop as the robot operates) followed by the adoption of autonomous robotics, as the technology advances; and (2) the use of fully independent robots from the outset, but using simple task menus until more autonomous robotic technology is developed. Attention is given to the relative merits of each approach in the illustrative case of EVA robots for routine station keeping tasks. The route of essential robot autonomy is concluded to provide the better EVA system. O.C.

A86-34980
SPACE STATION HUMAN PRODUCTIVITY STUDY
W. R. GONZALEZ (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) IN: Space and society - Progress and promise; Proceedings of the Twenty-second Space Congress, Cocoa Beach, FL, April 23-26, 1985 . Cape Canaveral, FL, Canaveral Council of Technical Societies, 1985, p. 9-7 to 9-10.

A study which is to develop design and operation requirements that will maximize the productiveness of crew performance in space is described. The analysis procedures utilized in this study are examined. Space Station designs and operations that could affect crew performance include: interior architecture, crew support, crew activities, and IVA/EVA interface. The development of a data base and management plans for establishing requirements is discussed. I.F.

A86-35185#
SPACE STATION DESIGN CRITERIA FOR LONG-TERM HUMAN HABITATION [ENTWURFSKRITERIEN FUER EINE RAUMSTATION IN HINSICHT AUF LANGZEITAUFENTHALT DES MENSCHEN]
P. TETZLAFF (ERNO Raumfahrttechnik GmbH, Bremen, West Germany) DGLR, Jahrestagung, Bonn, West Germany, Sept. 30-Oct. 2, 1985. 11 p. In German. refs
(DGLR PAPER 85-147)

The design criteria of technologies being developed to sustain human habitation aboard the Space Station for long periods are discussed. Systems aimed at maintaining life functions and to help astronauts cope with weightlessness are emphasized. Particular problem areas in these technologies are mentioned. C.D.

A86-35426
AEROSPACE BEHAVIORAL ENGINEERING TECHNOLOGY CONFERENCE, 4TH, LONG BEACH, CA, OCTOBER 14-17, 1985, PROCEEDINGS
Conference sponsored by SAE. Warrendale, PA, Society of Automotive Engineers, Inc., 1985, 444 p. For individual items see A86-35427 to A86-35458.
(SAE P-168)

Papers are presented on assessing human fitness and performance; the use of simulation as a cockpit design tool; the

man-machine interface; the Space Station; and human performance. Consideration is given to advanced transport aircraft technology; operator workload analysis; rotorcraft missions; the pilot in the operational loop; and flight crew training. Topics also discussed include cockpit communications; color displays; commercial air transport and general aviation operations; and space and military operations. I.F.

A86-35431
COCKPIT AUTOMATION - DESIGN AND IMPLEMENTATION ISSUES
R. W. MOSS and J. M. REISING (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 41-45. refs
(SAE PAPER 851921)

The relationship between pilots and the electronic crew member (EC) is discussed. The use of automation for decision making and its reliability are examined; the roles of the pilot and EC in decision making are studied. The implementation of the EC is described. Three examples of EC/pilot interaction are presented. I.F.

A86-35432
PILOT VEHICLE INTERFACES WITH SMART AVIONICS SYSTEMS
L. D. POHLMANN, J. B. SHELNUTT, and J. D. GILMOUR (Boeing Military Airplane Co., Seattle, WA) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 47-53. refs
(SAE PAPER 851923)

Design goals for the development of smart pilot vehicle interfaces (PVIs) are examined. The basic characteristics of smart PVIs and the pilot's role in combat aircraft are described. The need for the PVIs to anticipate pilot-system communication requirements, and the pilot/PVIs interaction required for evaluating situations are studied. Methods of presenting and regulating the PVIs information for the pilots are discussed. The ability of the PVIs to discuss abstract ideas such as strategy, risk, and tactics, and the use of direct communication of the pilot's intent to the avionics systems are proposed. I.F.

A86-35433* Boeing Aerospace Co., Seattle, Wash.
SPACE STATION CREW INTERFACE SPECIFICATIONS AND STANDARDS
C. W. GEER, K. H. MILLER (Boeing Aerospace Co., Seattle, WA), and J. L. LEWIS (NASA, Johnson Space Center, Houston, TX) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 57-70.
(SAE PAPER 851801)

NASA's Space Station Human Productivity and Man/System Integration Standards programs are described. The data collection methodologies and analyses utilized in the productivity study are examined. The study reveals that attention to habitability is required in order to maximize human productivity for on-orbit operations. The nine program tasks used to develop standards for man/system integration are discussed. I.F.

A86-35435* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE STATION CREW WORKLOAD - STATION OPERATIONS AND CUSTOMER ACCOMMODATIONS
G. L. SHINKLE (NASA, Johnson Space Center, Houston, TX) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 75-81. refs
(SAE PAPER 851803)

The features of the Space Station which permit crew members to utilize work time for payload operations are discussed. The user orientation, modular design, nonstressful flight regime, in space construction, on board control, automation and robotics, and maintenance and servicing of the Space Station are examined. The proposed crew size, skills, and functions as station operator and mission specialists are described. Mission objectives and crew functions, which include performing material processing, life science and astronomy experiments, satellite and payload equipment servicing, systems monitoring and control, maintenance and repair, Orbital Maneuvering Vehicle and Mobile Remote Manipulator System operations, on board planning, housekeeping, and health maintenance and recreation, are studied. I.F.

A86-35440
WORKLOAD ASSESSMENT - PROGRESS DURING THE LAST DECADE
T. M. MCCLOY and W. L. DERRICK (U.S. Air Force Academy, Colorado Springs, CO) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 125-130. USAF-supported research. refs
(SAE PAPER 851877)

Over the last decade, considerable research has been conducted on the construct of operator workload and its measurement. From this research, both theory and methods have evolved to provide valid assessment of this construct. Two classes of assessment methods, secondary tasks and subjective scales, dominate the literature at this time. This paper traces the development of both methods, ties their use to current theories of human processing resources, and evaluates both with respect to five criteria. Author

A86-35454* Miami Univ., Fla.
COCKPIT AUTOMATION - IN NEED OF A PHILOSOPHY
E. L. WIENER (Miami, University, FL) IN: Aerospace Behavioral Engineering Technology Conference, 4th, Long Beach, CA, October 14-17, 1985, Proceedings . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 369-375. refs
(Contract NCC2-152)
(SAE PAPER 851956)

Concern has been expressed over the rapid development and deployment of automatic devices in transport aircraft, due mainly to the human interface and particularly the role of automation in inducing human error. The paper discusses the need for coherent philosophies of automation, and proposes several approaches: (1) flight management by exception, which states that as long as a crew stays within the bounds of regulations, air traffic control and flight safety, it may fly as it sees fit; (2) exceptions by forecasting, where the use of forecasting models would predict boundary penetration, rather than waiting for it to happen; (3) goal-sharing, where a computer is informed of overall goals, and subsequently has the capability of checking inputs and aircraft position for consistency with the overall goal or intentions; and (4) artificial intelligence and expert systems, where intelligent machines could mimic human reason. K.K.

A86-35460
CONTROL ERRORS: PSYCHOLOGICAL CAUSES - AN AUTOMATED METHOD OF ANALYSIS [OSHIBKI UPRAVLENIIA: PSIKHOLOGICHESKIE PRICHINY, METOD AVTOMATIZIROVANNOGO ANALIZA]
M. A. KOTIK and A. M. EMELIANOV Tallinn, Izdatel'stvo Valgus, 1985, 391 p. In Russian. refs

An analysis is made of the psychological causes of human errors occurring in the control of technical and organizations. Various psychological theories explaining the nature of such errors are discussed, as are their relation to the individual qualities of the operator (administrator) and approaches to the analysis and prevention of control errors. A method of automatic error analysis is described whereby a computer is used to identify and eliminate the causes of errors. Practical applications of the method are illustrated by examples. V.L.

A86-36172* Tufts Univ., Medford, Mass.
THE EFFECTS OF SYNTACTIC COMPLEXITY ON THE HUMAN-COMPUTER INTERACTION
R. A. CHECHILE, R. N. FLEISCHMAN, and D. M. SADOSKI (Tufts University, Medford, MA) Human Factors (ISSN 0018-7208), vol. 28, Feb. 1986, p. 11-22. refs
(Contract NAG3-51)

Three divided-attention experiments were performed to evaluate the effectiveness of a syntactic analysis of the primary task of editing flight route-way-point information. For all editing conditions, a formal syntactic expression was developed for the operator's interaction with the computer. In terms of the syntactic expression, four measures of syntactic were examined. Increased syntactic complexity did increase the time to train operators, but once the operators were trained, syntactic complexity did not influence the divided-attention performance. However, the number of memory retrievals required of the operator significantly accounted for the variation in the accuracy, workload, and task completion time found on the different editing tasks under attention-sharing conditions.
Author

A86-36316
BIOIMPEDANCE MEASUREMENT WITH RESPECT TO PULSATILE PULMONARY BLOOD FLOW
T. R. WENG, M. KATAYAMA, E. K. MOTOYAMA, and R. P. HIRSCH (Pittsburgh, University, PA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, May 1986, p. 449-456. Research supported by the Children's Hospital of Pittsburgh and University of Pittsburgh. refs

The feasibility of using impedance plethysmography (IPG) to estimate pulsatile pulmonary distribution in seated objects is evaluated at three lung volumes, RV, FRC and TLC. The upright lung was divided into four equal sampling areas dorsally along the paravertebral space. The Kubicek formula was employed and results indicated a decrease in regional base resistance from the top to 3/4 down the lung and then a leveling off, while there was an increase in regional perfusion from the apex to 3/4 down, and a subsequent decrease. The sum of regional base resistance values was larger than the total sampling field resistance field, a discrepancy explained by the lead field theory. This IPG-determined regional perfusion gradient may represent the pulsatile perfusion gradient, as impedance analyzer outputs are intimately linked to the pulse-synchronous pulsatile nature of pulmonary blood flow. Hence, the advantages of the IPG technique lie in its safety, its noninvasiveness, and its simplicity in assessing regional pulmonary blood flow semiquantitatively in clinical settings or unusual environments.
K.K.

A86-36499
HYGIENIC ASSESSMENT OF THE ELECTROMAGNETIC RADIATION LEVELS GENERATED BY RADAR INSTALLATIONS [GIGIENICHESKAIA OTSENKA UROVNEI ELEKTROMAGNITNYKH POLEI, SOZDAVAEMYKH RADIOLOKATSIONNYMI STANTSIIAMI]
V. M. GAVRIUTIN and E. G. ZHILIAEV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), Feb. 1986, p. 32-34. In Russian.

A method is described for evaluating the safety of an electromagnetic environment surrounding radar installations. The procedure is based on a plot of radar antenna systems and the residence and work locations on a detailed topographic map and of a relief profile correlated with the same area. The drawing of vertical projection lines between two maps permits the construction of a distribution chart for the electromagnetic radiation, on the basis of which safe locations for human residence and work can be determined.
I.S.

A86-36527
AN INFORMATIONAL ASSESSMENT OF CHANGES IN THE PHYSIOLOGICAL CHARACTERISTICS OF AN OPERATOR UNDER DIFFERENT WORK REGIMENS [INFORMATSIONNYI PODKHOD K OTSENKE IZMENENII FIZIOLOGICHESKIKH KHARAKTERISTIK OPERATORA PRI RAZNYKH REZHIMAKH EGO RABOTY]
IU. P. GORGO (Kievskii Gosudarstvennyi Universitet, Kiev, Ukrainian SSR) Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 253-257. In Russian. refs

A PNN-2 psychoanalyzer that issues multicolored signals requiring timed responses was used to assess the subjects' ability to concentrate. At the same time, the subjects' EKG R-R cardiointervals were recorded automatically. The test conditions simulated normal work tempo, work requiring maximal concentration, and the no-work (control) conditions. The time intervals needed to respond to simple stimuli were found to be shorter under conditions of concentrated activity than under conditions of normal work. The lengths of the latent response periods correlated reliably with the extent of organization of the R-R cardiointervals, indicating that this parameter can be used in assessing the ability to concentrate and thus the potential efficiency of an operator under changing work regimens.
I.S.

A86-36536
METHOD FOR THE QUANTITATIVE DETERMINATION OF THE PARASYMPATHETIC REGULATION OF CARDIAC ACTIVITY IN OPERATORS WORKING IN SEALED CHAMBERS [METOD KOLICHESTVENNOGO OPREDELENIIA PARASIMPATICHESKOI REGULIATSII SERDECHNOI DEIATEL'NOSTI V USLOVIIAKH PREBYVANIIA OPERATORA V GERMOOB'EMAKH]
A. A. ANTONOV and E. B. PETROVA Fiziologiia Cheloveka (ISSN 0131-1646), vol. 12, Mar.-Apr. 1986, p. 340-342. In Russian. refs

A quantitative index measuring the parasympathetic effect on the cardiac activity was defined on the basis of EKG characteristics of cardiac cycles. Experiments were conducted in male subjects performing operational work for 5 hrs in a sealed chamber. The subjects received various doses of Inderal taken orally or a placebo. While in the control subjects (placebo), the parasympathetic index increased 2 to 3 times at the end of the experiment, the subjects receiving 0.16 g of Inderal exhibited 30-fold increases of the index, indicating the high sensitivity of the index to changes in the vagus activity (effected by Inderal). The method can be used to characterize vagotonia.
I.S.

A86-36695
VISUAL-SEARCH EFFICIENCY [EFFEKTIVNOST' VIZUAL'NOGO POISKA]
N. P. TRAVNIKOVA Moscow, Izdatel'stvo Mashinostroenie, 1985, 128 p. In Russian. refs

An effort is made to summarize and systematize literature data on visual search (VS). This makes it possible to define the main parameters of VS, to assess their effect on the detection of objects, and to derive analytical relationships for these parameters which would make it possible to predict the detection of various objects. Particular consideration is given to the threshold conditions for the observation of objects with the unaided eye; the characteristics of the VS of extended objects; the search for point sources of light; the estimation of the probability of object detection; and methods for assessing VS efficiency.
B.J.

A86-36852#
THE USE OF ELLIPSOIDAL SOLIDS TO DISPLAY HUMAN BODY DYNAMIC RESPONSE
D. H. LAANANEN and D. KALITA (Arizona State University, Tempe) IN: Computers in engineering 1985; Proceedings of the International Computers in Engineering Conference and Exhibition, Boston, MA, August 4-8, 1985. Volume 2 . New York, American Society of Mechanical Engineers, 1985, p. 11-17. refs
(Contract DOT-FA03-84-P-01649)

An algorithm for displaying the human body modeled as a set of ellipsoids with hidden lines omitted is described. The algorithm is implemented as a post-processor for a dynamic simulation of an aircraft occupant and seat in a crash environment. It includes consideration of complete penetration of one ellipsoid into another and total obscuration of one by another, features which are desirable for display of the abnormal body positions that can result in a vehicle crash. Also, interaction of the ellipsoids with the polygonal representations of the restraint system and seat has been considered. Results are illustrated by examples of output produced for an aircraft crash simulation. Author

A86-36879#
SIMULATION OF AIRCRAFT SEAT RESPONSE TO A CRASH ENVIRONMENT
D. H. LAANANEN (Arizona State University, Tempe) IN: Computers in engineering 1985; Proceedings of the International Computers in Engineering Conference and Exhibition, Boston, MA, August 4-8, 1985. Volume 3 . New York, American Society of Mechanical Engineers, 1985, p. 241-246. refs
(Contract DOT-FA03-84-P-01649)

A three-dimensional mathematical model of an aircraft seat, occupant, and restraint system has been developed for use in analysis of light aircraft crashworthiness. Because of the significant role played by the seat in overall system crashworthiness, a finite element model of the seat structure is included. The seat model can accommodate large displacements, nonlinear material behavior, and local buckling of tubular elements. The occupant model consists of twelve segments whose dimensions and inertial properties have been determined from studies of human body anthropometry and kinematics and from measurements of anthropomorphic test dummies. The seat and occupant models are described, along with the simulation program, and some examples of output data are provided. Author

A86-36940
THE ROLE OF FLIGHT SIMULATION IN HELICOPTER CREW STATION DESIGN
J. N. DEMASI and H. P. HARPER (Sikorsky Aircraft, Stratford, CT) IN: Flight simulation/simulators; Proceedings of the Aerospace Technology Conference and Exposition, Long Beach, CA, October 14-17, 1985 . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 1-10. refs
(SAE PAPER 851900)

The need for simulation is assessed in the context of changing missions and technology; and the helicopter simulation facilities at the Sikorsky Aircraft Division are described in detail. These facilities include the human factors engineering laboratory, the avionics laboratory, the fixed-base simulator, the motion base simulator, and an in-flight simulator. It has been shown that simulation, an essential part of the crew station design process, can be applied at many levels. Simulator capabilities must cover a broad spectrum of fidelity levels with the capability to tie real hardware with the software simulation. It is concluded that in-flight simulation is necessary to provide realism for critical mission elements and to provide a validation of anchor points. Block diagrams are included. K.K.

A86-37037* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THE HUMAN ROLE IN SPACE: TECHNOLOGY, ECONOMICS AND OPTIMIZATION
S. B. HALL, ED. (NASA, Marshall Space Flight Center, Huntsville, AL) Park Ridge, NJ, Noyes Publications, 1985, 398 p. No individual items are abstracted in this volume.

Man-machine interactions in space are explored in detail. The role and the degree of direct involvement of humans that will be required in future space missions are investigated. An attempt is made to establish valid criteria for allocating functional activities between humans and machines and to provide insight into the technological requirements, economics, and benefits of the human presence in space. Six basic categories of man-machine interactions are considered: manual, supported, augmented, teleoperated, supervised, and independent. Appendices are included which provide human capability data, project analyses, activity timeline profiles and data sheets for 37 generic activities, support equipment and human capabilities required in these activities, and cumulative costs as a function of activity for seven man-machine modes. C.D.

A86-37047*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE TELEROBOTICS - A FEW MORE HURDLES
J. E. PENNINGTON (NASA, Langley Research Center, Hampton, VA) IEEE, International Conference on Robotics and Automation, San Francisco, CA, Apr. 8-10, 1986, Paper. 5 p. refs

In the early 1990's, a telerobotic work system which can be used with the Mobile Remote Manipulator System (MRMS) on the Space Station is to become available. However, a number of difficulties have to be overcome before these plans can be realized. The word 'telerobotics' is used in connection with a system which can function as teleoperator, and which, in addition, has also autonomous functions. Thus, as a robot, the system would automatically perform selected operations using multisensory internal feedback for control. A role for telerobotics is defined, taking into account EVA servicing and repair work, remote satellite refueling, and operations during the Space Station development period. Attention is also given to the definition of a telerobotic system, the definition of the telerobotics technology set, and approaches related to the development of a telerobotic system. G.R.

N86-25121*# Essex Corp., Huntsville, Ala. Space Systems Group.
THE DESIGN, FABRICATION AND DELIVERY OF A MANIPULATOR FOOT RESTRAINT MOCKUP FOR SPACE TELESCOPE DEVELOPMENT TESTING Final Report
M. A. HOLLINGSWORTH 11 Apr. 1986 12 p refs
(Contract NAS8-36366)
(NASA-CR-178837; NAS 1.26:178837; H-86-05) Avail: NTIS HC A02/MF A01 CSCL 05H

The Manipulator Foot Restraint (MFR) is a subsystem of the Remote Manipulator System (RMS) which plays a major role in servicing the Hubble Space Telescope (HST) in orbit. Flight drawings were used to construct the MFR to guarantee that the mockup components were functionally equivalent to the flight MFR. Material surface finishes and tolerances that were compatible to the Neutral Buoyance Simulator (NBS) environment were used. Recommendation for improvements are discussed. B.G.

N86-25122*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
PHYSICAL, ANTHROPOMETRICAL, AND BODY COMPOSITION CHARACTERISTICS OF WORKERS AT KENNEDY SPACE CENTER
M. L. LASLEY Sep. 1985 55 p refs
(Contract NAS10-10285)
(NASA-TM-83102; NAS 1.15:83102) Avail: NTIS HC A04/MF A01 CSCL 05H

At the Kennedy Space Center, workers are often exposed to cardiovascular and muscular stress in job-related activities which

may require a high level of physical fitness in order to safely complete the work task. Similar tasks will be performed at other launch and landing facilities and in space for the Space Station. One such category includes workers who handle toxic propellants and must wear Self-Contained Atmospheric Protective Ensembles (SCAPE) that can weigh 56 lbs. with the air pack. These suits provide a significant physical challenge to many of the workers in terms of carrying this load while moving about and performing work. Furthermore, under some conditions, there is a significant thermal stress. The physical characteristics of these workers are, therefore, of consequence. The purpose of this study was to analyze the anthropometry, body composition, strength, power, endurance, flexibility, aerobic fitness, and blood variables of a representative sample of male KSC SCAPE workers and to compare them with characteristics of other male workers at KSC (total population N=110). Three separate comparisons were made. Author

N86-25123# Naval Postgraduate School, Monterey, Calif.
MAN-MACHINE SYSTEMS OF THE 1990 DECADE: COGNITIVE FACTORS AND HUMAN INTERFACE ISSUES
P. J. HOFFMAN Aug. 1985 53 p refs
(AD-A163865; NPS74-85-002) Avail: NTIS HC A04/MF A01 CSCL 05H

This paper presents the primary psychological concepts which are fundamental to the design of man-machine interfaces for intelligent systems of the 1990's. These concepts embrace perception, learning motivation, and cognitive capacities of human operators, in systems which require a high degree of operator-machine interaction. The central role of feedback is emphasized through simple schematic examples, designed to provide an understanding of the reciprocity requirements in man-machine communication. Cognitive theory and recent experimental data form the basis for discussion of visual image storage, short-term memory, long-term memory, transfer rates and buffering of information being processed by the human operator, under control of a central processor with a cycle time of roughly 70 milliseconds. Systems of the 1990 era will provide increased capability for high-speed processing of data and will utilize increasing numbers of decision-aides, spreadsheets and AI tools. Users of these systems will be components of networks, linked via efficient communication systems to other users and other subsystems. These developments will lead to fundamental changes in the work place. GRA

N86-25124# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECT OF COLD TRAINING AND THE WEARING OF GLOVES ON MANUAL PERFORMANCE IN THE COLD: A COMPARISON OF PURE ABILITY AND OPERATIONAL TASKS Final Report
W. H. ROGERS 14 Nov. 1985 19 p refs
(AD-A163893; NSMRL-1067) Avail: NTIS HC A02/MF A01 CSCL 06Q

Cold-induced manual performance decrements pose a serious problem for military cold weather operations. Experiments were based on the notion that the amount of decrement, and possibly the best means for reducing that decrement, depend on the specific motor abilities required to perform a given task. Experiments have been performed using a battery of pure-ability tasks so that ultimately results could be generalized to any task. The study conducted here had the following goals: (1) to complement the previous studies in terms of the cold temperatures tested, and obtain profiles of performance of decrements and cold-injury dangers across a range of cold temperatures; (2) to assess the wearing of gloves and temperature-specific training as potential methods of reducing or eliminating cold-induced manual performance decrements; and (3) to validate and compare results previously and currently obtained using pure-ability tasks with those obtained using operational tasks. A battery of five pure ability and four operational tasks were administered to six four-man groups of U.S. Marines. Three groups practiced the tasks at room temperature on the first of three training days and at -10 C on the other two training days, while the other three groups practiced at room temperature on all three days. GRA

N86-25125# Naval Submarine Medical Research Lab., Groton, Conn.
AN EVALUATION OF COLOR SETS FOR CRT DISPLAYS Interim Report
D. F. NERI, A. R. JACOBSON, and S. M. LURIA 31 Dec. 1985 30 p refs
(AD-A163894; NSMRL-1068) Avail: NTIS HC A03/MF A01 CSCL 06P

Ten subjects performed a color matching task with ten sets of seven colors, adapted from sets recommended in the literature. The color sets covered a wide range in color difference values. Performance with some color sets was significantly better than that with others on a task where color discrimination was important and the colors needed to be discriminated quickly and accurately. Effectiveness of a color set did not depend on the inclusion of any particular colors; rather, the relationships among colors proved to be important. The larger the color difference value between the two most perceptually similar members of a set, the shorter the reaction time and the fewer the errors on the color matching task. Author (GRA)

N86-25126# National Inst. for Occupational Safety and Health, Cincinnati, Ohio. Div. of Biomedical and Behavioral Science.
COMPENDIUM OF PROTECTIVE EYEWEAR
C. E. MOSS Mar. 1985 87 p refs
(PB86-135779) Avail: NTIS HC A05/MF A01 CSCL 06Q

Wearing apropriate eye and face protection devices will prevent or minimize most eye and/or facial injuries. However, at present there is no data source available on commercially available eye and face protectors. To provide characteristics and other product information, this compendium has been developed to list all commercially available eyewear products manufactured in the United States as of July 1, 1984. The protectors listed in this compendium include spectacles, goggles, welding helmets/hand shields, face shields, and filter plates. The information provided will assist the health and safety community in selecting appropriate eye and face protection for the job. GRA

N86-25993# School of Aerospace Medicine, Brooks AFB, Tex.
A SMALL OXYGEN CONCENTRATOR Final Report, Jun. 1983 - Jul. 1984
C. F. THEIS, K. G. IKELS, and R. G. DORNES Dec. 1985 25 p
(AD-A163145; USAFSAM-TR-85-18) Avail: NTIS HC A02/MF A01 CSCL 06K

Onboard oxygen generating systems (OBOGS) require large quantities of air. When toxic contaminants are present, this air volume can become a problem. A small oxygen concentrator (SOC) was developed to operate at 10% the air volume and 4% the molecular sieve weight of the OBOGS. This paper gives detailed instructions on the construction of the SOC. The SOC was tested at inlet pressures of 10, 20, 30, and 40 psig and at product flows of 0.25, 0.50, 1.00, and 1.50 lpm. The SOC beds were packed with 5A or 13X molecular sieve. Additional tests were conducted with the SOC beds at 25 C, 50 C, and 60 C and using 5A molecular sieve. The SOC performance at various inlet pressures and temperatures, as measured by the oxygen concentration in the product gas, demonstrates characteristics similar to the performance of the full-size OBOGS. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-33688
A SEARCH FOR INTERSTELLAR GLYCINE
I. I. BERULIS, G. WINNEWISER, V. V. KRASNOV (AN SSSR, Fizicheskii Institut, Moscow, USSR), and R. L. SOROCHENKO (Koeln, Universitaet, Cologne, West Germany) (Pis'ma v Astronomicheskii Zhurnal, vol. 11, Aug. 1985, p. 599-604) Soviet Astronomy Letters (ISSN 0360-0327), vol. 11, July-Aug. 1985, p. 251-253. Translation. refs

A search for three 8-mm line microwave lines of glycine conformer II toward Sgr B2, W51, and Ori A was conducted with the RT-22 telescope of the Pushchino Radio Astronomy Station during 1982-1983. The search placed respective upper limits of (4, 6, 2) x 10 to the 13th/sq cm on the column density. B.J.

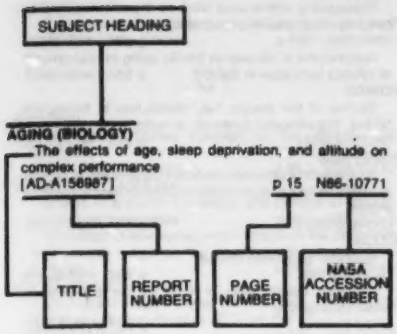
A86-34489
SIMULATION OF THERMAL POLYCONDENSATION PROCESSES OF AMINO ACIDS DURING THE MIGRATION OF THEIR AQUEOUS SOLUTIONS IN THE EARTH'S LITHOSPHERE [MODELIROVANIE PROTSESSOV TERMICHESKOI POLIKONDENSATSII AMINOKISLOT PRI MIGRATSII IKH VODNYKH RASTVOROV V LITOSFERE ZEMLI]
G. A. LAVRENTEV, T. F. STRIGUNKOVA, I. A. EGOROV, L. IU. RAKITIN, and L. A. PISKUNOVA (AN SSSR, Institut Biokhimii, Moscow, USSR) Akademiia Nauk SSSR, Doklady (ISSN 0002-3264), vol. 287, no. 2, 1986, p. 455-459. In Russian. refs

The possibility of abiogenic peptide synthesis in the earth's lithosphere was investigated under conditions simulating the geological environment in the lithosphere. A continuous flow of amino acid solutions (containing glycine, alanine, valine, leucine, isoleucine, phenylalanine, lysine, arginine, aspartic acid, and glutamic acid) was passed under pressure through a heated reactor filled with layers of crushed kaolinite. At conditions of 200 C and 20 atm nitrogen, significant amounts of peptides (of 700 and higher molecular weight) are synthesized. Compared with the starting solution, the peptides are considerably enriched in lysine. Moreover, the products contain measurable amounts of serine, absent from the starting solution. A possibility is suggested that life might have originated in the lithosphere, before it appeared on the earth surface. I.S.

A86-36766
COSMOLOGICAL AND ANTHROPIC PRINCIPLES, COSMIC AND PLANETARY EVENTS, AND THE EXISTENCE OF LIFE IN THE UNIVERSE
M. SUBOTOWICZ (Lublin, Uniwersytet, Poland) Postepy Astronautyki (ISSN 0373-5982), vol. 18, no. 3-4, 1985, p. 113-131. refs

A discussion is presented which assesses the consequences for CETI and SETI research of the probabilities for the existence of extraterrestrial intelligent life implicit in the 'anthropic principle' (AP). AP, while essentially independent of the existing body of physical theory, is strongly supportive of the universality of intelligent life. Attention is also given to other threats, primarily of a physical or practical character, to the conduct of SETI efforts or the accomplishment of CETI; these encompass termination of SETI funding in virtue of public and government indifference, the jamming of CETI reception by increasingly powerful anthropogenic transmissions in orbital space, and the nonsynchronicity of high civilizations capable of SETI/CETI efforts from proximate planetary systems. O.C.

Typical Subject Index Listing



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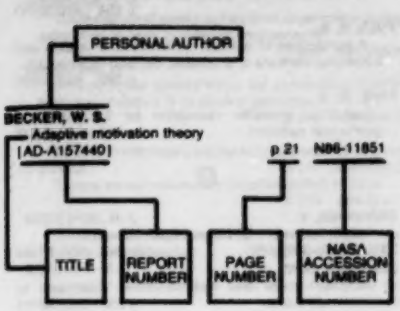

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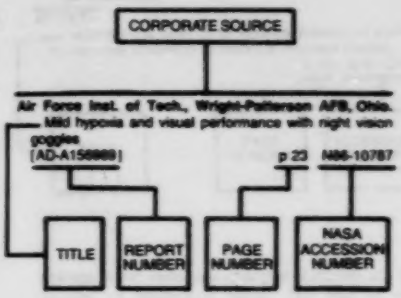

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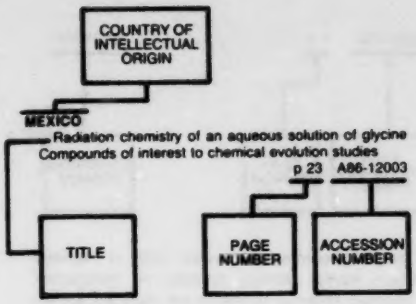

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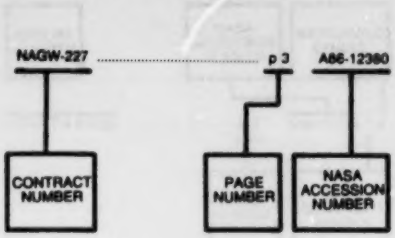

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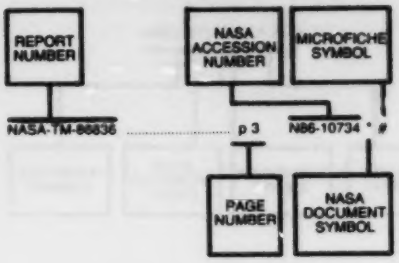

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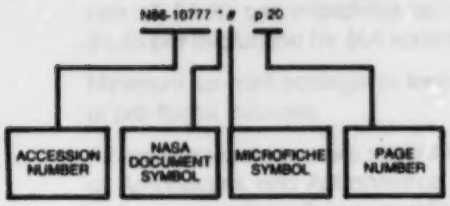

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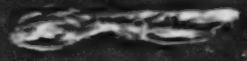

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 289)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in September 1986 in

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 210 reports, articles and other documents announced during September 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 54 Man/System Technology and Life Support 293
Includes human engineering; biotechnology; and space suits and protective clothing.

Category 55 Planetary Biology 296
Includes exobiology; and extraterrestrial life.

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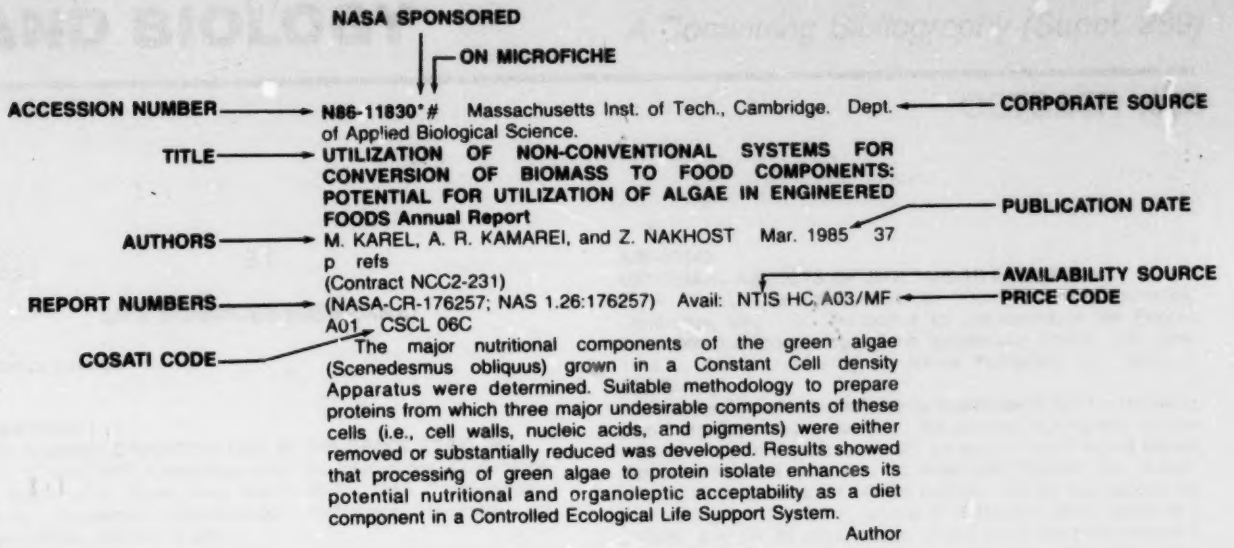
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N86-11830*# Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.
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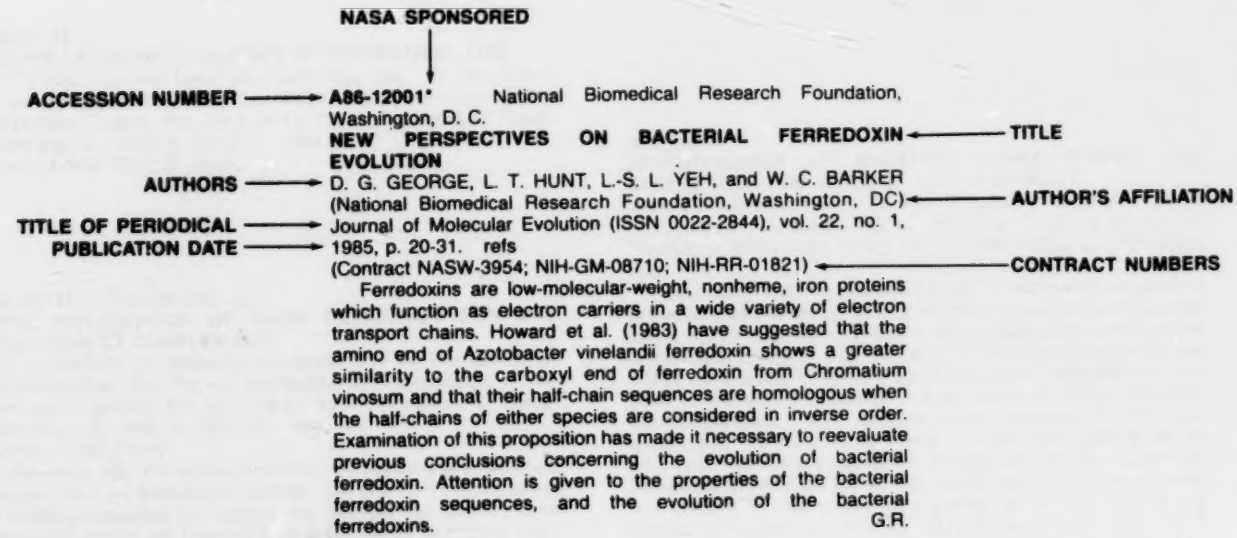
TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHORS
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
(Contract NCC2-231)
AVAILABILITY SOURCE
REPORT NUMBERS
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
PRICE CODE
COSATI CODE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT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ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
AUTHORS
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)
AUTHOR'S AFFILIATION
TITLE OF PERIODICAL
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1,
PUBLICATION DATE
1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
CONTRACT NUMBERS
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 289)

OCTOBER 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-37855#
LIFE SCIENCE OPPORTUNITIES IN THE SPACE STATION
L. R. YOUNG (MIT, Cambridge, MA) IN: International Conference on Space, 25th, Rome, Italy, March 26-28, 1985, Proceedings . Rome, Rassegna Internazionale Elettronica Nucleare ed Aerospaziale, 1985, p. 73-76.

Areas of research in the life sciences are pointed out that could benefit greatly when the facilities of the Space Station become available. Research subjects and problems meriting work include: human physiology (cardiovascular system deconditioning, loss of bone minerals, loss of muscle mass, vestibular system reaction to weightlessness); gravitational biology; and the study of the origin and evolution of life on earth. Some facilities that will be needed to conduct this research are mentioned, in particular the variable g centrifuge for use by various disciplines and capable of handling humans as well as animals and plants. D.H.

A86-38146
THE PRECAMBRIAN EVOLUTION OF TERRESTRIAL LIFE
A. H. KNOLL (Harvard University, Cambridge, MA) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 201-211. refs
(Contract NSF BSR-82-13682)

A86-38147* Chicago Univ., Ill.
SOME IMPLICATIONS OF MASS EXTINCTION FOR THE EVOLUTION OF COMPLEX LIFE
J. J. SEPKOSKI, JR. (Chicago, University, IL) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 223-232. refs
(Contract NAG2-282)

Extinction has the destructive effect of eliminating established lineages from an evolutionary system, and the constructive effect of vacating ecospace into which new lineages can evolve. Mass extinctions, which are times of unusually intense extinction, have been consistently followed by major radiations of new lineages. Extraterrestrial impacts associated with extinction events and a periodic recurrence of these events implicates an extraterrestrial forcing mechanism as the ultimate cause of mass extinction. This suggests that the extraplanetary environment has played an important, active role in the development of complex life on earth. Author

A86-38149
UNIVERSAL ASPECTS OF BIOLOGICAL EVOLUTION
J. A. BALL (Harvard-Smithsonian Center for Astrophysics, Cambridge, MA) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 251-254.

The question of universal biology is addressed and the following points are discussed in detail: (1) the concept of progress can be defined in a fairly precise way; (2) the earth's fossil record shows that progress has occurred; (3) even after Darwin, the reason why is hardly understood; (4) the problem can be approached by considering the differential survival of replicators called genes and memes, and (5) an extrapolation of the trend predicts continued progress for earth's biosystem and presumably for other civilizations. It is concluded that what is needed is a unified general theory that contains Prigogine's dissipative structures in non-equilibrium thermodynamics, the origin of life and biological systems from nonliving material, Darwinian evolution by mutation and natural selection of replicators, and progress through accumulation of information in hierarchial structures up through civilizations, all as special cases or corollaries. Such a theory would define a level-of-development parameter for a system in terms of its useful information or instruction content. It would also define progress as an increase in the level of development, and then it would specify the conditions under which progress may or may not take place. K.K.

A86-39096
HEMODYNAMICS OF MINIATURE SWINE DURING +GZ STRESS WITH AND WITHOUT ANTI-G SUPPORT
J. W. BURNS, M. J. PARNELL, and R. R. BURTON (USAF, School of Aerospace Medicine, Brooks AFB, TX) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1628-1637. refs

The relation between venous flow (VF), head-level arterial blood pressure, and increasing +Gz is examined. Nine, female miniature swine weighing between 31.0-56.0 kg are subjected to head-to-tail inertial load levels of +3, +5, and +7 Gz for 60 sec, with and without anti-G-suit inflation. An inserted probe and catheter were used to measure VF, central venous pressure (CVP), abdominal venous pressure (AVP), eyelevel blood pressure (ELBP), and esophageal pressure. A decrease in ELBP from control of 75, 113, and 160 pct without G-suit inflation and of 50, 65, and 98 pct with G-suit inflation for +3 Gz, +5 Gz, and +7 Gz, respectively is recorded; VF decreases from control by 41, 48, and 64 pct without G-suit inflation and by 20, 31, and 39 pct with G-suit inflation at increasing Gz levels. The effects of an anti-G-strain maneuver on the cardiovascular system is investigated; increases in the continuous AVP-to-CVP gradient and the VF are observed during no strain and increasing +Gz. The data reveal VF occurs at all +Gz levels with and without G-suit support and there is no correlation between the decrease in VF and the increase in ELBP during +Gz. I.F.

A86-39097
EXERCISE CONDITIONING INCREASES RAT MYOCARDIAL CALCIUM UPTAKE
S. N. LEVINE and G. T. KINASEWITZ (Louisiana State University, Medical Center, Shreveport) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1673-1679. Research supported by the American Heart Association. refs
(Contract NIH-HL-27999)

A86-39470* California Univ., Santa Barbara.
ARE INTERPRETATIONS OF ANCIENT MARINE TEMPERATURES CONSTRAINED BY THE PRESENCE OF ANCIENT MARINE ORGANISMS?
J. W. VALENTINE (California, University, Santa Barbara) IN: The carbon cycle and atmospheric CO2: Natural variations archean to present; Proceedings of the Chapman Conference on Natural Variations in Carbon Dioxide and the Carbon Cycle, Tarpon Springs, FL, January 9-13, 1984 . Washington, DC, American Geophysical Union, 1985, p. 623-627. refs
(Contract NSF EAR-81-21212; NAG2-73)

The relationship between marine temperature and marine organisms is investigated. The adaptation of organisms to extreme temperatures is studied; it is observed that chemautotrophic and chemoheterotrophic prokaryotes adapt to 100 C, photoautotrophic prokaryotes to 73 C, and fungi to 60 C. The physiological and molecular factors related to thermal limits in organisms such as enzymes, lipids, or plasma membranes, are examined. Two types of thermal adaptations, resistance and capacity, are detected in organisms. Reasons for species distributions according to temperature barriers are proposed by Read (1967) and Bullock (1955) and are related to enzyme limits. The effects of an organism's composition on thermal stability is analyzed. I.F.

A86-39718
CYCLIC ADENOSINE-3',5'-MONOPHOSPHATE AND CYCLIC GUANOSINE-3',5'-MONOPHOSPHATE IN THE BLOOD PLASMA OF MICE INJECTED WITH CHEMICALS OF DIFFERENT RADIOPROTECTIVE EFFICIENCY [TSIKLICHESKIE ADENOZIN-3',5'-MONOFOSFAT I GUANOZIN-3',5'-MONOFOSFAT V PLAZME KROVI MYSHEI PRI VVEDENII KHIMICHESKIKH SOEDINENII, OBLADAIUSHCHIKH RAZLICHNOI PROTIVOLUCHEVOI EFFEKTIVNOST'IU]
A. N. KOTEROV, A. V. NIKOLSKII, V. P. BEKETOV, and N. B. PUSHKAREVA (Institut Biofiziki, Moscow, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Mar.-Apr. 1986, p. 195-200. In Russian. refs

A86-39719
CHANGES IN THE CARBOHYDRATE ENERGY METABOLISM IN THE RAT BRAIN UNDER LASER RADIATION [IZMENENIIA UGLEVODNO-ENERGETICHESKOGO OBMENA V GOLOVNOM MOZGE KRYS PRI LAZERNOM OBLUCHENII]
A. T. PIKULEV, T. N. ZYRIANOVA, M. F. KUKULIANSKAIA, V. M. LAUROVA, S. I. MOKHOREVA (Belorusskii Gosudarstvennyi Universitet, Minsk, Belorussian SSR) et al. Radiobiologiia (ISSN 0033-8192), vol. 26, Mar.-Apr. 1986, p. 205-208. In Russian. refs

A86-39720
AN ANAEROBIC SHIFT IN ENERGY METABOLISM IN THE MOUSE BRAIN DURING RECOVERY FROM ACUTE RADIATION SICKNESS [ANAEROBNYI SDVIG ENERGETICHESKOGO OBMENA V GOLOVNOM MOZGE MYSHEI V VOSSTANOVITEL'NOM PERIODE OSTROI LUCHEVOI BOLEZNI]
A. V. POPOV, L. A. KOZHEMIAKIN, and IU. IU. IVNITSKII (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Mar.-Apr. 1986, p. 235-237. In Russian. refs

A86-39721
THE MECHANISMS OF THE EFFECT OF NONIONIZING RADIATION ON AN ORGANISM'S SENSORY SYSTEMS [K VOPROSU O MEKHANIZMAKH DEISTVIIA NEIONIZIRUIUSHCHIKH IZLUCHENII S ZHIVYM ORGANIZMOM NA UROVNE SENSORNYKH SISTEM]
A. A. ARIFULIN, M. S. BURENKOV, A. V. DAVIDENKO, V. IU. PICHUGIN, R. M. SALIMOV (Institut Biofiziki, Moscow, USSR) et al. Radiobiologiia (ISSN 0033-8192), vol. 26, Mar.-Apr. 1986, p. 247-250. In Russian. refs

The effect of electromagnetic radiation (EMR) on the function of the central nervous system was studied in rats and mice. In rats, exposure to microwave radiation for 10 min led to a lowering of the EEG response to rhythmic photostimulation, due to sensory interference. The role of cutaneous receptors in the sensory effects of microwaves was studied in mice subjected to 5 min of EMR alone or to EMR following (by two weeks) an exposure to low intensity ionizing radiation (from Co-60). Both EMR and gamma rays separately led to a significant and equal increase in the measured response to cold while the combination of both types of radiation led to a cancellation of the observed increases. The role of skin receptors in the sensory changes effected by EMR is discussed. I.S.

A86-39722
THE EFFECT OF RADIATION ON THE CONCENTRATION AND METABOLISM OF DOPAMINE IN THE RAT BRAIN [VLIIANIE OBLUCHENIIA NA SODERZHANIE I OBMEN DOFAMINA V GOLOVNOM MOZGE KRYS]
V. I. LEGEZA, M. F. KAMYNINA, I. V. MARKOVSKAIA, and M. G. SHAGOIAN (Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Radiobiologiia (ISSN 0033-8192), vol. 26, Mar.-Apr. 1986, p. 262-264. In Russian. refs

N86-26793# Johns Hopkins Univ., Baltimore, Md. School of Medicine.
MACROPHAGE STRUCTURE AND FUNCTION Final Report, 1 Feb. 1982 - 31 Jan. 1985
T. AUGUST 19 Dec. 1985 9 p
(Contract N00014-82-K-0221)
(AD-A163314) Avail: NTIS HC A02/MF A01 CSCL 06A

Extensive progress has been made in the identification and characterization of several proteins active in the human immune response. These results are summarized as follows: Preparation of Monoclonal Antibodies; Identification of Cell Proteins; Characterization of the Human Lymphocyte Function Antigen (HLFA); The In Vitro Formation of Multinucleated Giant Cells Induced from Monocytes by Monoclonal Anti-HLA-DR; Antibodies that Inhibit the Mixed Lymphocyte Reaction (MLR). GRA

N86-26794# Office of Naval Research, London (England).
BIOTECHNICA '85 INTERNATIONAL CONGRESS FOR BIOTECHNOLOGY
C. E. ZOMZELY-NEURATH 27 Feb. 1986 24 p Congress held in Hannover, East Germany, 8-10 Oct. 1985
(AD-A165415; ONRL-C-13-85) Avail: NTIS HC A02/MF A01 CSCL 06A

The First International Congress and Exhibition, Biotechnical '85, which took place from 8 through 10 October 1985 at the Hannover Exhibition Grounds, was designed to provide an insight into the structure and growth potential of the relatively new biotechnology market. The congress, which included exhibitions, seminars, workshops, and panel discussions, focused on the commercial and industrial applications of biotechnology. The congress received support from the European Community because of its emphasis on fostering contacts between industry and academia. Over 170 companies, as well as research institutes and universities from 15 countries, disseminated information about current developments in research, laboratory equipment, and production techniques. The topics in the scientific program presented at the symposia sessions were divided into three general areas: (1) measurement of process control and development of

models; (2) biocatalyst preparation, utilization, and improvement; and (3) animal and plant cell cultures. GRA

N86-26795# Center for Mathematics and Computer Science, Amsterdam (Netherlands). Dept. of Computer Science.
DEVELOPMENT, GROWTH AND TIME
P. M. B. VITANYI Aug. 1985 20 p Revised Submitted for publication
(CWI-CS-R8516; B8575498; ESA-86-97007) Avail: NTIS HC A02/MF A01

A simple mathematical model for filamentous growth and development is proposed. The model relates stereotype elemental (cellular) behavior to empirically observed overall growth curves. The sigmoidal growth curves are obtained. The separation of subjective or physiological time of the organism from objective or absolute, and the relation between them are emphasized. The underlying philosophy is related to Lindenmayer's developmental model. ESA

N86-26796 Washington Univ., Seattle.
THE ROLE OF THE OCEANS IN THE ATMOSPHERIC CYCLE OF CARBONYL SULFIDE
J. E. JOHNSON 1985 111 p
Avail: Univ. Microfilms Order No. DA8529909

The magnitude of the global air-sea flux of carbonyl sulfide (OCS) was assessed. Air and seawater concentrations of OCS from the equator to the Aleutian Islands were measured. The Henry's law constant of solubility for OCS was measured in the laboratory for filtered and boiled seawater at three temperatures. These measurements show: (1) the atmospheric concentration of OCS is very constant and the latitudinal gradient, if any, is small, with a maximum gradient of 7% between 50 deg N and the equator; (2) the ocean surface layer is supersaturated with OCS and is therefore a source for the atmosphere instead of a sink; (3) there appears to be a subsurface maximum in the OCS concentration in the oceanic mixed layer in tropical waters; (4) values for the solubility of OCS in seawater are 10% lower than reported elsewhere; (5) a history of measurements of atmospheric OCS by four groups shows that any secular trend in atmospheric OCS is less than 3%/ yr; (6) the budget for atmospheric OCS is still not well understood. Dissert. Abstr.

N86-27864*# Management and Technical Services Co., Washington, D.C.
USSR SPACE LIFE SCIENCES DIGEST, ISSUE 6
L. R. HOOKE, ed., M. RADTKE, ed., R. TEETER, ed., and J. E. ROWE, ed. Washington NASA Jun. 1986 131 p
(Contract NASW-3676)
(NASA-CR-3922(07); NAS 1.26:3922(07)) Avail: NTIS HC A07/MF A01 CSCL 06C

This is the sixth issue of NASA's USSR Space Life Sciences Digest. It contains abstracts of 54 papers recently published in Russian language periodicals and bound collections and of 10 new Soviet monographs. Selected abstracts are illustrated with figures and tables from the original. Additional features include a table of Soviet EVAs and information about English translations of Soviet materials available to readers. The topics covered in this issue have been identified as relevant to 26 areas of aerospace medicine and space biology. These areas are adaptation, biospherics, body fluids, botany, cardiovascular and respiratory systems, developmental biology, endocrinology, enzymology, exobiology, genetics, habitability and environment effects, health and medical treatment, hematology, human performance, immunology, life support systems, mathematical modeling, metabolism., microbiology, morphology and cytology, musculoskeletal system, neurophysiology, nutrition, perception, personnel selection, psychology, radiobiology, reproductive biology, and space medicine. Author

N86-27865# Electrotechnical Lab., Ibaraki (Japan).
STUDIES ON INFORMATION PROCESSING MECHANISMS IN THE CENTRAL VISUAL SYSTEM OF THE CAT
S. KAJI Dec. 1985 42 p
(EL-861; ISSN-0366-9106; UDC-5.72.788.916.3) Avail: NTIS HC A03/MF A01

The characteristics of information processing of visual neurons were investigated, including nonlinear summation and contour enhancement effects of concentric receptive fields, and neural interactions between detectors for the same or different stimulus domains. A model was proposed to explain the results of antagonistic actions between the center and surrounding regions in the concentric receptive field of lateral geniculate neurons. The response of lateral geniculate neurons with concentric receptive fields to large two-dimensional figures was investigated. The interactions between the different orientation detecting processes were investigated in the orientation sensitive neurons of the visual cortex. The neural interactions between two direction-selective processes as well as between direction and selective process were investigated in the complex type neurons, using a non-oriented textured stimulus (two-dimensional random noise pattern) and an oriented grating. B.G.

N86-27866# Federal Aviation Administration, Washington, D.C. Office of Aviation Medicine.
INHALATION TOXICOLOGY. 5: EVALUATION OF RELATIVE TOXICITY TO RATS OF THERMAL DECOMPOSITION PRODUCTS FROM TWO AIRCRAFT SEAT FIRE-BLOCKING MATERIALS Report, Oct. 1983 - Sep. 1984
D. C. SANDERS, C. R. CRANE, and B. R. ENDECOTT Nov. 1985 16 p
(AD-A165034; DOT-FAA-AM-86-1) Avail: NTIS HC A02/MF A01 CSCL 06T

Two fire-blocking layer (FBL) materials, designed to delay the thermal decomposition of polyurethane foam seat cushions during an aircraft cabin fire, were evaluated for the relative toxicity of their gaseous combustion products. Each materials was thermally decomposed under five distinct thermal environments: two contact temperatures (600 and 750 c) in a horizontal hot tube furnace and three flux levels (2.5, 5.0, and 7.5 w/cm) in a radiant heat furnace. The measured toxicological endpoint was time-to-incapacitation (+ sub i) in the albino rat; this endpoint is believed to be the most relevant one for assessing smoke hazard in a fire environment. In three of the five test environments, norfab, an aluminized synthetic fabric, produced shorter + sub i--and was thus toxic--than vonar, a neoprene foam. However, at 2.5 w/cm in the radiant furnace system, the norfab test specimen lost only 13 percent of the sample weight and did not incapacitate any of the test animals during the exposure period and, at 750c (flaming) in the combustion tube assembly, norfab produced longer and more variable + sub i than did vonar. Hydrogen cyanide (hcn) was detected in the combustion products from norfab under all test conditions except the 2.4 w/cm radiant flux level; no HCN was dtected in the test c onditions except the 2.5 w/+ sub i radiant flux level; no HCN was detected in the combustion products from any of the vonar tests. GRA

N86-27867# George Washington Univ., Washington, D.C.
MICROWAVE EFFECTS ON CNS: A HISTOPATHOLOGIC, ULTRASTRUCTURAL AND AUTORADIOGRAPHIC STUDY Final Report
E. N. ALBERT 20 Feb. 1986 69 p
(Contract N00014-78-C-0527)
(AD-A165040) Avail: NTIS HC A04/MF A01 CSCL 06R

The objectives of this investigation were to: (1) investigate the effects of electromagnetic fields on the release of calcium ions from nervous tissue, (2) examine for histological changes, if any, of young rat brains after 2.45 GHz microwave exposure, and (3) study the rat brain metabolism during 2.45 GHz microwave exposure using 2-Deoxyglucose. In conclusion, the data presented here demonstrates that the specific radiofrequency radiation used does not perturb Ca ions efflux from avian brain tissue under in vitro conditions. Comparison of this data with that gathered by

Blackman's group, however, suggests that appropriate radiofrequency radiation in conjunction with certain other physical factors may indeed perturb Ca ions efflux. GRA

N86-27868# Brookhaven National Lab., Upton, N. Y.
LATE BIOLOGICAL EFFECTS FROM INTERNAL AND EXTERNAL EXPOSURE
W. H. ADAMS 1985 12 p Presented at the Health Physics Society Symposium Hammond, La., 28 May 1985
(Contract DE-AC02-76CH-00016)
(DE86-001181; BNL-37087; CONF-8505213-1) Avail: NTIS HC A02/MF A01

Information on late biological effects of radiation was obtained from the long-term medical followup of a small population of Marshallese accidentally exposed to radioactive fallout from a thermonuclear test in 1954. Endocrine data are compatible with a sequence of nonstochastic radiation effects. The ingestion of radioisotopes of iodine produced clinical thyroid hypofunction in children, biochemical evidence of thyroid dysfunction in some adults, thyroid adenomatous module formation, and, as a possible indirect effect of thyroid damage, at least two cases of pituitary adenoma. In contrast, the only evidence of a stochastic effect has been a real increase in thyroid cancers among the more highly exposed people of Rongelap, none of whom have evidence of residual disease. While three nonthyroidal cancers which are known to be inducible in humans by external irradiation have been documented in the exposed population, three similar cancers have occurred in an unexposed comparison population of Marshallese. Nonstochastic effects of radiation exposure may be common but subtle. In the Marshallese experience the morbidity of delayed nonstochastic effects far exceeds that of the stochastic. DOE

N86-27869# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
9 May 1986 143 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-008) Avail: NTIS HC A07/MF A01

Topics on life sciences addressed include: aerospace medicine, agrotechnology, biochemistry, biophysics, biotechnology, epidemiology, food technology, genetics, human factors engineering, immunology, clinical medicine, microbiology, physiology, public health, psychology, radiation biology, and virology.

N86-27871# Joint Publications Research Service, Arlington, Va.
COMMENTARY ON RESULTS OF BIOLOGICAL SATELLITE PROGRAM
Y. FABBISHENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 2 9 May 1986 Transl. into ENGLISH from Meditsinskaya Gazeta (Moscow, USSR), 15 Jan. 1986 p 4
Avail: NTIS HC A07/MF A01

The Kosmos-1667 satellite carried two monkeys and other biological specimens. The experimental animals were employed to gather scientific data which is difficult or impossible to obtain from human subjects. The monkeys were monitored with 20 sensors and provided data on the mechanism of changes in an organism during the period of acute change. B.G.

N86-27873# Joint Publications Research Service, Arlington, Va.
INFLUENCE OF SHIPBOARD ENVIRONMENTAL FACTORS ON CONDITIONED REFLEX ACTIVITY OF EXPERIMENTAL ANIMALS DURING A LONG VOYAGE
O. Y. NETUDYKHATKA, A. P. STOYANOV, and V. N. YEVSTAFYEV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 98 9 May 1986 Transl. into ENGLISH from Fiziologicheskiy Zhurnal (Kiev, USSR), v. 31, no. 6, Nov. - Dec. 1985 p 688-691
Avail: NTIS HC A07/MF A01

The influence of environmental factors encountered on board a ship, with predominance of the noise vibration component, was studied with the conditioned reflex activity of experimental animals. Experiments were performed on 120 male Wistar white rats during a 90-day voyage of a freighter. The influence of specific shipboard environmental factors was evaluated on the basis of studies on conditioned motor reflexes involving response to a sound signal which preceded application of a mild electric shock by 5 seconds. The changes in the conditioned reflex activity varied with intensity and duration of training. Differences in the avoidance reaction were observed in all groups of animals, indicating an increase in the degree of inhibitory processes in the central nervous system as a result of the influence of the unfavorable sanitary-hygienic factors characteristic for the working spaces in ships. Author

N86-27877# Joint Publications Research Service, Arlington, Va.
CHANGE OF RNA AND PROTEIN LEVEL IN NEURONS-GLIA SYSTEM UNDER EFFECTS OF HYPERTHERMIA AND HYPOXIA
L. M. MAMALYGA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 103 9 May 1986 Transl. into ENGLISH from Izvestiya Akademii Nauk Moldavskoy SSR. Seriya Biologicheskikh i Khimicheskikh Nauk (Kishinev, USSR), no. 5, Sep. Oct. 1985 p 42-47
Avail: NTIS HC A07/MF A01

Functional and metabolic possibilities of different brain structures, under the effects of hyperthermia, hypoxia, and combinations of both, were studied by cytochemical and morphological methods in experiments performed on Wistar male white rats (weight 160 to 180 g) (age 5 to 6 months). Rats were subjected to simulated altitude of 8200 m, to hyperthermia at 40 C for 75 minutes, or to combined hyperthermia and hypoxia at 8200 m and 40 C for 75 minutes. After the experiment, rats were decapitated without use of anesthesia and RNA level and total and basic proteins in various neuron-glia systems were studied. Separate and combined effects of hyperthermia and hypoxia in the organism produced metabolic and morpholocigal changes in the brain structures studied. Reduction of RNA level and proteins in the neurons under combined effect of hyperthermia and hypoxia decreased their cytoplasm volume; overheating dehydrated the organism, reduced the volume of circulating blood, increased its viscosity, and reduced the hemoglobin level in the erythrocytes. The combined effect of hyperthermia and hypoxia, increasing at different rates, decreased the resistance of the animal to altitude considerably. Author

N86-27878# Joint Publications Research Service, Arlington, Va.
USSR REPORT: SPACE BIOLOGY AND AEROSPACE MEDICINE, NO. 1, JANUARY - FEBRUARY 1986
17 Apr. 1986 161 p Transl. into ENGLISH of Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), no. 1, Jan.-Feb. 1986 94 p
(JPRS-USB-86-003) Avail: NTIS HC A08

Presented is the translation of a journal on space biology and aerospace medicine published in the USSR. The journal is divided into areas of surveys, experimental and general theoretical research, methods, and brief reports. Some representative topics are: Prospects for using ultraviolet radiation in long term spaceflights; Some human reactions during seven-day antiorthostatic hypokinesia; Effect of diphosphonates on bones of hypokinetic rats; Effect of different doses of ultraviolet radiation on vitamin levels in man; Reproductive capacity of microflora on polymers used in sealed environments; and amino acid spectrum of human blood in the presence of emotional stress.

N86-27888# Joint Publications Research Service, Arlington, Va.
COLLAGEN, LIPID AND GLYCOGEN CONTENT OF RAT SKELETAL MUSCLES IN RECOVERY PERIOD AFTER 15- AND 30-DAY HYPOKINESIA
P. P. POTAPOV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 45-48 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 33-35
Avail: NTIS HC A08

On the 15th hypokinetic day, carcass mass, glycogen and lipid content in skeletal muscles decreased while collagen content increased. The content of collagen returned to the norm by the 7th day of the recovery period. By that time the glycogen content increased significantly and a week later decreased noticeably. The content of total lipids and triglycerides was higher than the baseline level on the 15th and 30th days of the recovery period. On hypokinesia day 30 carcass mass and glycogen content decreased while collagencontent increased. After 30-day hypokinesia, glycogen significantly increased on the 7th day and returned to the norm by the 60th day of the recovery period. Lipid content was elevated only on the 7th day of the recovery period, and collagen content returned to the norm on the 15th day of the recovery period. Following 15- and 30-day hypokinesia, carcass mass returned to the baseline level by the 30th day of the recovery period. Author

N86-27889# Joint Publications Research Service, Arlington, Va.
MORPHOLOGICAL AND BIOCHEMICAL INVESTIGATION OF RAT ADRENOCORTICAL FUNCTION DURING LONG-TERM HYPOKINESIA
Y. V. VOROTNIKOVA and Y. A. ZAGORSKAYA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 59-65 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 41-45
Avail: NTIS HC A08

Female rats exposed to 3-month hypokinesia were used to study adrenal morphology and plasma corticosterone. Prolonged hypokinesia (60 to 90 days) led to a dissociation between adrenal hypertrophy and lower corticosterone content in plasma. During hypokinesia, rats were also exposed to an additional stress effect, i.e., 5-hour immobilization. This approach showed that in the course of 90-day hypokinesia the adrenal cortex retained its ability to react to an acute stress by an enhanced corticosteroid secretion. Moreover, in response to stress effects of identical strength and duration the experimental adrenals produced more corticosterone than the controls with no structural rearrangement or delipoidization. Author

N86-27890# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIPHOSPHONATES ON BONES OF HYPOKINETIC RATS
V. N. SHVETS, A. S. PANKOVA, O. Y. KABITSKAYA, Z. Y. VNUKOVA, and B. V. MORUKOV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 66-72 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 45-49
Avail: NTIS HC A08

The diphosphonate effect on bones was studied in Wistar male rats weighing about 200 g. The rats were kept for 60 days in small size cages where their motor activity was diminished. Every day the rats were given 0.3% solution of 1-hydroxy-ethylene-1,1-diphosphonate (HEDP) containing 9 mg/kg phosphorus. In the course of hypokinetic exposure the rats developed generalized osteoporosis. Histomorphometric measurements demonstrated that the drug did not prevent mineral losses from the tubular bones (humerus, femur). However, the drug led to a complete bone mass recovery in the pelvix and a partial recovery in the sternum. The drug also produced a preventive effect on the population of cells-precursors of osteogenesis, the number of which decreases significantly during hypokinesia. Author

N86-27891# Joint Publications Research Service, Arlington, Va.
EXPERIMENTS WITH DEVELOPING PLANTS ABOARD SALYUT-5, SALYUT-6 AND SALYUT-7 ORIBITAL STATIONS
L. N. KOSTINA, I. D. ANIKEYEVA, and E. N. VAULINA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 73-78 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 53-56
Avail: NTIS HC A08

The experiments with air dry Crepis capillaris seeds flown on the spacecraft Soyuz-16 and orbital stations Salyut-5, Salyut-6 and Salyut-7 showed that the number of aberrant cells in the seedlings grown during flight (experimental) and after flight (flight control) was higher than in the ground based control. This number was greater in the experimental seedlings than in the flight controls. The plants Arabidopsis thaliana grew from cotyledons to flowers during flight. The seeds developed postflight exhibited a lower fertility and a higher frequency of recessive mutants. The greater number of mutants persisted in the progeny of plants that completed their developmental cycle. Inhibited viability of germs manifested as a reduced germination rate of flown seeds and a premature death of seedlings. In the first postflight generation the lesions produced by large chromosome aberrations were eliminated and the lesions caused by gene mutations and microaberrations were retained. Author

N86-27894# Joint Publications Research Service, Arlington, Va.
PHYSICAL ENDURANCE OF RATS DURING INTENSIVE AND REPEATED EXPOSURE TO STATIONARY MAGNETIC FIELD
L. V. KOKOREVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 92-94 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, Jan. - Feb. 1986 p 61-63
Avail: NTIS HC A08

Variations in physical endurance of rats exposed to a constant magnetic field of 1.6 T for 3 hours a day during 30 days were investigated. The parameter was measured as the time of swimming with a load making 10% of body weight until complete arrest. The rats exposed once, 5 or 15 times showed a longer time of swimming than the controls. On the 30th day of exposure there was no difference between the experimental and control animals. The data obtained suggest that exposure to a constant magnetic field produces a stimulating effect on physical work capacity during the first 15 days. Author

N86-27896# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIBASOL AND SOME OF ITS IMIDAZO ANALOGUES ON ANIMAL TOLERANCE TO GRAVITATIONAL ACCELERATIONS AND DYNAMICS OF DEVELOPMENT OF POSTISCHEMIC CEREBROVASCULAR PHENOMENA
V. K. VERESHCHAGIN and M. D. GAYEVYY *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 100-105 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 67-70
Avail: NTIS HC A08

Anesthetized and nonanesthetized animals were used to study the effect of dibazolum and its new imidazo analogs (designated AKS-67 and AKS-87) on animal tolerance to gravitational effects and cerebral ischemia (ligation of both carotid arteries), as well as on systemic arterial pressure and tone of cerebral and peripheral vessels (resistographically) in the postischemic period. The drugs were administered 30 to 90 min before exposure. It was found that in nonanesthetized rats dibazolum and AKS-87 increased tolerance to cranio-caudal acceleration and decreased it to caudo-cranial acceleration, whereas AKS-67 produced a distinct protective effect regardless of the vector. In anesthetized rats (bilateral carotid ligation) AKS-67 and AKS-87 increased

acceleration tolerance and dibazolum produced no protective effect. Dibazolum enhanced postischemic hypotension while AKS-67 and AKS-87 delayed or completely arrested it. For aerospace medicine the drug AKS-67 is of particular importance because it increases significantly animal tolerance to acceleration and stabilizes arterial pressure in the postischemic period.
Author

N86-27897# Joint Publications Research Service, Arlington, Va.
REPRODUCTIVE CAPACITY OF MICROFLORA ON POLYMERS USED IN SEALED ENVIRONMENTS
N. D. NOVIKOVA, M. I. ORLOVA, and M. B. DYACHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 106-109 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 71-73
Avail: NTIS HC A08

The main representatives of human automicroflora were examined to identify the microorganisms that can grow and develop on various polymers used in an enclosed interior. Bacteria of the genera Pseudomonas, Proteus and Bacillus were found to be most proliferative. Microbial growth was strongly influenced by environmental parameters of the enclosure and by the chemical structure of the polymer.
Author

N86-27898# Joint Publications Research Service, Arlington, Va.
RESTRAINT SYSTEM FOR WAKING MACACA MULATTA MONKEYS DURING POSTURAL TESTS
V. P. MELNICHENKO, M. D. GOLDOVSKAYA, V. P. KOTOV, A. G. POPOV, I. S. KONDAKOVA, and N. V. GORBATENKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 110-112 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 73-74
Avail: NTIS HC A08

Postural tests are a convenient model for investigation of the distinctions in physiological functions with changes in body position in relation to the vector of Earth's gravity. Postural tests are difficult to perform on waking Macaca mulatta monkeys because of their general motor activity, the level of which depends largely on how the animals are immobilized on the turntable. A restraint system involving the use of a special suit is known. The results of the observations revealed that the system of immobilization must meet the following requirements: it should not cause any pain to the animal and must reduce to a minimum the effect of factors that elicit discomfort; it must provide for a standard position of the monkey on the turntable platform; it must prevent passive displacement of the monkey under the effect of gravity when the turntable is tilted. For this reason, a restraint system was developed, the principal elements of which are an immobilization suit, a device that restricts head movements, a device that restricts the monkey's body movements in orthostatic position. The above system was used in postural tests on monkeys weight 3.5 to 6 kg. The system provided reliable, sparing immobilization of monkeys on the turntable and was convenient to work with.
E.R.

N86-27900# Joint Publications Research Service, Arlington, Va.
DIRECT SPECTROPHOTOMETRIC METHOD OF ASSAYING AMMONIA CONCENTRATION IN GAS ENVIRONMENT OF SEEDING CHAMBERS
A. A. POLOVINKIN and A. N. KRAVCHUK *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 120-122 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, Jan. - Feb. 1986 p 78-80
Avail: NTIS HC A08

Toxicologists have been traditionally using colorimetry methods to measure ammonia concentration in the air environment. Colorimetric methods are simple to use, they have rather high sensivity and accuracy. However, they also have a number of flaws. Use of a spectrophotometric method of assaying ammonia in an air environment eliminates these flaws. A combined unit was developed and used for measurement of ammonia concentration in the range of 1 to 150 mg/cu m in the atmosphere of seeding chambers in toxicological experiments. The method is based on using the absorption maximum of ammonia at a wavelength of 204.3 mm. Introduction of the device to practical toxicological studies makes it possible to effect continuous monitoring, recording and correction of ammonia content of seeding chambers.
E.R.

N86-27903# Joint Publications Research Service, Arlington, Va.
INTENSITY OF PHOTOSYNTHESIS IN CLOSTERIOPSIS ACICULAR VAR. AFRICANA HIND AS A FUNCTION OF OXYGEN CONCENTRATION IN THE ATMOSPHERE
M. A. LEVINSKIKH *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 129-131 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 83-84
Avail: NTIS HC A08

When unicellular algae are included in the photoautotrophic link of closed ecological systems, it is important to know their attitude toward different concentrations of oxygen in the atmosphere. The adverse influence of high concentrations of oxygen on photosynthesis is known as the Warburg effect. The inhibitory effect of high oxygen content on photosynthetic productivity of algae referable to different taxonomic groups has been repeatedly confirmed by many authors. In particular, for a number of Chlorella strains it was shown that intensity of photosynthesis, in the case of both cumulative and continuous long term cultivation, is directly related to concentration of oxygen in the gas phase. At the same time, there is information to the effect that some algae can retain productivity when partial oxygen pressure is raised both in the range of 3 to 5 to 21% and up to 40 to 80%. Finally, it was established that the photosynthetic process in Chlorella sorokiniana ORS is resistant to oxygen concentrations in the atmosphere of up to 95%. The intensity of photosynthesis in Closteriopsis acicularis var. africana Hind., family Ankistrodesmaceae, as a function of oxygen concentration in the reactor's gas phase was investigated.
Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-39092
EPINEPHRINE-INDUCED CHANGES IN MUSCLE CARBOHYDRATE METABOLISM DURING EXERCISE IN MALE SUBJECTS
E. JANSSON, P. HJEMDAHL, and L. KAIJSER (Karolinska Sjukhuset; Karolinska Institutet, Stockholm, Sweden) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1466-1470. Research supported by the Karolinska Institutet; Medicinska Forskningsradet. refs
(Contract MF-4494; MF-5930)

A86-39093
FOREARM SKIN AND MUSCLE VASOCONSTRICTION DURING LOWER BODY NEGATIVE PRESSURE
A. TRIPATHI (John B. Pierce Foundation Laboratory, New Haven, CT) and E. R. NADEL (Yale University, New Haven, CT) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1535-1541. refs

In view of conflicting reports of skeletal muscle and skin blood flow participation in baroreceptor-mediated reflexes, the effects of graded lower body negative pressure (LBNP) on cutaneous and muscular components of forearm blood flow (FBF) in seven male

subjects at 28 C are studied. FBF was measured by venous occlusion plethysmography and cutaneous flow by laser-Doppler velocimetry, the difference being the muscular flow. Mean FBF decreased by 39 and 56 percent from control at LBNP of 20 and 50 Torr, respectively. Skin flow decreased linearly with graded LBNP contributing 32 percent of the decrease of total blood flow at 20 Torr and then 50 percent of the total decrease of blood flow at 50 Torr. Conversely, the decrease in muscle flow represented 68 percent of the total decrease at LBNP of 20 Torr and then 50 percent of the total decrease at LBNP of 50 Torr. It is concluded that both skin and muscle circulations participate in sustained peripheral vasoconstriction during LBNP, with muscle flow achieving near maximum vasoconstriction by 20 Torr and skin showing a graded vasoconstriction to decreases in LBNP.
Author

A86-39094
HUMAN THERMOREGULATORY RESPONSES TO COLD AIR ARE ALTERED BY REPEATED COLD WATER IMMERSION
A. J. YOUNG, S. R. MUZA, M. N. SAWKA, R. R. GONZALEZ, and K. B. PANDOLF (U.S. Army, Research Institute of Environmental Medicine, Natick, MA) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1542-1548. refs

A86-39095
PULMONARY GAS EXCHANGE IN HUMANS DURING EXERCISE AT SEA LEVEL
M. D. HAMMOND, G. E. GALE, K. S. KAPITAN, A. RIES, and P. D. WAGNER (California, University, La Jolla; California University, Medical Center, San Diego) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1590-1598. refs
(Contract NIH-HL-17731; NIH-RR-00827)

Gas exchange in eight male subjects between 22 + or - 1.5 yr during exercise at sea level is studied using the multiple-inert gas-elimination technique. The order of work load is: (1) rest, (2) minimal exercise, (3) heavy exercise, (4) heavy exercise while breathing 100 pct O2, (5) rest, (6) moderate exercise, and (7) light exercise. Mixed expired and arterial respiratory and inert gas tensions, cardiac output, heart rate, ventilation, respiratory rate, and blood temperature were measured at rest and during exercise. It is obeserved that the alveolar-to-arterial O2 tension difference increases linearly with O2 uptake revealing a decrease in the efficiency of pulmonary gas exchange. The effect of ventilation-perfusion inequality and diffusion limitation on the increase is analyzed. It is detected that the ventilation-perfusion inequality and diffusion limitation increases during exercise from 0.28 + or - 0.13 to 0.58 + or 0.30 and 100 pct O2 breathing does not alter this reaction. The data confirm that increasing ventilation-perfusion inequality and O2 diffusion limitation occur during heavy exercise at sea level and these changes are independent of the work load order. I.F.

A86-39098
PHYSIOLOGICAL PROFILE OF WORLD-CLASS HIGH-ALTITUDE CLIMBERS
O. OELZ, H. HOWALD, P. E. DI PRAMPERO, H. HOPPELER, H. CLAASSEN (University Hospital, Zurich; Swiss School for Physical Education and Sports, Magglingen; Centre Medical Universitaire, Geneva; Bern, Universitaet, Switzerland) et al. Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1734-1742. Research supported by the EMDO-Stiftung. refs
(Contract SNSF-3,332,78; SNSF-3,128,081; SNSF-3,364,082)

The physiological characteristics of six climbers who had reached an altitude of 8500 m or above without supplemental O2 are studied 2-12 months after high-altitude exposure. The muscle fiber types, muscle morphometry, maximal aerobic and anaerobic power, ventilation control, oxygen/hemoglobin saturation, and heart rate of the climbers are compared to sedentary controls (SCs) and long-distance runners (LDRs). The maximal O2 consumption of 60 + or - 6 ml/kg per min, anaerobic power of 28 + - 2.5 W/kg, muscle types and morphometry, and the ventilatory response of the climbers correlate with SCs and/or LDRs; however, the HbO2 pct of the climbers is higher than that of the SCs and LDRs. It is noted that except for higher HbO2 saturation, high-altitude climbers do not possess physiological characteristics that enhance their adaptation to high altitudes. I.F.

A86-39099* State Univ. of New York, Buffalo.
A FUNDAMENTAL PROBLEM IN DETERMINING FUNCTIONAL RESIDUAL CAPACITY OR RESIDUAL VOLUME
U. BOUTELLIER and L. E. FARHI (New York, State University, Buffalo) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, May 1986, p. 1810-1813.
(Contract NAS9-16042)

To measure a lung volume that is not directly accessible, one often follows dilution of a single-gas tracer, present initially only in the lung or in a rebreathing bag. The final volume available to the tracer is assumed to be the sum of the two initial components. Since O2 is taken up and CO2 is eliminated during the few breaths required for mixing, the total volume changes. The error in lung volume due to this volume change can exceed 10 pct. Theoretical and experimental data is presented to demonstrate the effect of CO2 and O2 exchange. A general equation, based on N2 and Ar, which allows one to circumvent the problems created by these fluxes is introduced. The pitfall of the back-extrapolation approach for a single tracer is shown.
Author

A86-39598
HUMAN BODY IMPEDANCE AND THRESHOLD CURRENTS FOR PERCEPTION AND PAIN FOR CONTACT HAZARD ANALYSIS IN THE VLF-MF BAND
I. CHATTERJEE, O. P. GANDHI (Utah, University, Salt Lake City), and D. WU (East China Normal University, Shanghai, People's Republic of China) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, May 1986, p. 486-494. refs
(Contract F33615-83-R-0613)

The body impedance and threshold currents for perception and pain in the VLF-to-MF band (10 kHz-3 MHz) obtained from measurements on 367 male and female human subjects in the 18-70 year age range, allowed the calculation of average values and the formulation of valid statistical predictions for the general adult population. Tests using various types of contact simulating contact with different vehicles indicate that human body impedance is inversely proportional to body dimensions, and that the threshold current for perception is proportional to the square of the body dimensions. Results suggest that the 0.3-3 MHz frequency band ANSI guideline 632 V/m is too high for many situations, and that safety devices such as safety shoes and gloves only offer adequate protection up to 1 MHz for VLF, and 4 MHz for MF currents. The human hand/ungrounded van handle contact current flow is shown to be as high as 879 mA, and to produce a local wrist SAR of about 1045 W/kg. R.R.

A86-39772
FLIGHT FITNESS AND A PAST MYOCARDIAL INFARCTION [APTITUDE AU VOL ET INFARCTUS DU MYOCARDE ANCIEN]
G. LEGUAY, A. SEIGNEURIC (Hopital d'Instruction des Armees Dominique Larrey, Versailles, France), and J. DRONIOU (Hopital d'Instruction des Armees Val-de-Grace, Paris, France) (Entretiens de Medecine Aerospatiale, 5th, Le Bourget, France, June 3, 4, 1985) Medecine Aeronautique et Spatiale, vol. 25, 1st Quarter, 1986, p. 14-20. In French. ref

Recent advances in diagnostic techniques have led to a reconsideration of the impact of a previous myocardial infarction (MI) on certification for flight fitness. Current practice is to declare pilots who experience an MI permanently unfit for flight duty. An MI is precipitated by an inert fibrous placque on the contractile myocardium, causing a ventricular dysfunction (VD) and cardiac disrhythmia (CI). The symptoms are monitored by cavitary scintigraphy, echography and angiography (VD) and ECG and scintigraphy (CI). However, only coronorography (CG), performed by an expert, can identify the precise state of health and permit an accurate prognosis. The flight environment, particularly hypoxic conditions, increased catecholamine levels due to increased stresses during takeoff and landing, and dehydration (common

among flight crews) are predisposing factors to MI attacks. Since an MI is only symptomatic of other evolutive conditions, a judgement of unfit for flight duty is thought to be correct unless continued medical monitoring over a period of months reveals a recession in symptoms, accompanied by appropriate changes in life style. Restricted flight duty may then be allowed. The restrictions include the presence of a copilot, the avoidance of hypoxic altitudes and dehydration conditions, and ECG and CI examinations twice a year. M.S.K.

A86-39773
A PRACTICAL ATTITUDE TOWARD VENTRICULAR REPOLARIZATION ABNORMALITIES IN FLIGHT CREWS [ATTITUDE PRATIQUE DEVANT DES ANOMALIES DE LA REPOLARISATION VENTRICULAIRE CHEZ LE PERSONNEL NAVIGANT]
D. THOMAS, M. KOMAJDA, and Y. GROSGOGEAT (Centre Hospitalier Universitaire La Pitie-La Salpetriere, Paris, France) (Entretiens de Medecine Aerospatiale, 5th, Le Bourget, France, June 3, 4, 1985) Medecine Aeronautique et Spatiale, vol. 25, 1st Quarter, 1986, p. 24-28. In French. refs

The results of epidemiological studies of the frequency of repolarization abnormalities (RA) in the general population and in flying personnel are discussed from the point of view of the implications of the RA in the absence of other evidence for coronary problems. For the general population, out of 6786 subjects aged 19-83 yr, 7.9 percent registered RAs. For 8625 RAF personnel, 3.9 percent exhibited variations in the ST segment or the T wave. Other studies have also been performed, and all indicate that the RA data have no significance unless there are other symptoms of ventricular problems. The application of an ECG stress test has been 45 percent effective in detecting the presence or confirming the absence of collateral dysfunctions. However, the ECG stress tests can be a vital aid in identifying other ventricular problems among flight personnel who, if no other abnormalities appear during the test, can be considered healthy and certified fit for flight. Further, more invasive tests are indicated if RAs appear during the stress tests of flying personnel. M.S.K.

A86-39774
NORMAL OR PATHOLOGICAL CORONARY STATUS - REFLECTIONS AND PRACTICAL EXPERIENCES FOR EXPERTISE WITH FLIGHT PERSONNEL [ÉTAT CORONARIEN NORMAL OU PATHOLOGIQUE? - REFLEXIONS ET INCIDENCES PRATIQUES POUR L'EXPERTISE DU PERSONNEL NAVIGANT]
M. KOMAJDA, D. THOMAS, and Y. GROSGOGEAT (Centre Hospitalier Universitaire La Pitie-La Salpetriere, Paris, France) (Entretiens de Medecine Aerospatiale, 5th, Le Bourget, France, June 3, 4, 1985) Medecine Aeronautique et Spatiale, vol. 25, 1st Quarter, 1986, p. 31-34. In French. refs

The major techniques used in judging the normality or pathology of a coronary artery are reviewed. The performance of many autopsies have demonstrated that coronary stenoses is a function of sex and age. Atherosclerosis may be present at infancy and progress after that point, or may appear in the form of lipidic striations or fibro-muscular placques and remain clinically latent. Symptoms appear when multiple ulcerations or thromboses occur. Various invasive methods for assessing the degree of coronary stenosis have not proved as useful as myocardial scintigraphy with Thallium 201 for measuring the ventricular flow rates and reserves. The type of pain described by the patient is also important and can aid in the diagnosis of up to 90 percent of the dysfunctions. ECG measurements will only reveal abnormalities if made under stressful conditions. The ECG data, if continued for 24-48 hr, can reveal the presence of problems in ventricular rhythm or fibrillation. These tools are valuable for aerospace medicine in that they permit diagnosing the magnitude of stenosis and the chances that myocardial ischemia or rhythm abnormalities can be precipitated by normal flight duties. Experimental designs are described which could lead to a greater predictive capability for coronary problems. M.S.K.

A86-39775
SLEEP IN AN AEROSPACE ENVIRONMENT [SOMMEIL EN MILIEU AEROSPATIAL]
J. COLIN Medecine Aeronautique et Spatiale, vol. 25, 1st Quarter, 1986, p. 61-70. In French. refs

The causes and symptoms of sleep disturbances in aerospace environment are discussed. Travel by air or in space disrupts human circadian rhythms by moving people and their physiological rhythms out of synchronization with an external light/darkness cycle and the local time zone. The problem is acute in night and long-duration flights and when confronting wide variations in the day/night period. The loss of synchrony is highest in east-west and west-east flights. Physiological data on the diurnal cycles of various biological and psychological factors are provided to illustrate the behavior of internal clocks, e.g., internal temperature, adrenaline secretions, psychomotor performance, etc., to correspond with the local day/night cycle. Many minimums occur during the normal middle of the night. Resynchronization to a new time arrangement requires a length of time that varies with the individual. Consequently, days, even weeks pass before a person can sleep at a time appropriate to the local environment. Regarding spaceflight, experience in the Gemini program encouraged NASA to schedule astronaut activities in space at times that correspond with the day/night schedule at Cape Kennedy, thereby separating the day/night cycle (90 min) from the place of travel. M.S.K.

N86-26797* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Jun. 1986 105 p
(NASA-SP-7011(285); NAS 1.21:7011(285)) Avail: NTIS HC A06/MF A01 CSCL 06E

This bibliography lists 319 reports, articles, and other documents introduced into the NASA scientific and technical information system in May 1986. Author

N86-26798# Naval Ocean Systems Center, San Diego, Calif.
MECHANISM OF ELECTROMAGNETIC ENERGY EFFECTS ON THE NERVOUS SYSTEM: VOLTAGE-CLAMP STUDY Final Report, Oct. 1981 - Sep. 1984
C. L. BRANDT and N. L. CAMPBELL Jul. 1985 69 p refs
(AD-A164653; NOSC/TR-1051) Avail: NTIS HC A04/MF A01 CSCL 06R

Low-level microwave energy at a frequency of 2.45 GHz has been previously observed to alter the firing frequency of Aplysia californica neurons. This study was undertaken to search out the mechanism of this microwave effect by examining the influences of microwave energy on specific ion currents across the cell membrane that influence the cell's firing frequency. Late outward K(+) current was examined and showed no statistically significant change during microwave exposure. The membrane current shape during voltage clamping (the summation of several different ionic currents) also showed no change during exposure except in one instance when exposure was concurrent with the application of Na(+) free artificial sea water. GRA

N86-26799# Boston Univ., Mass. School of Medicine.
FLUID-ELECTROLYTE-MINERAL INTERRELATIONS AS AFFECTING WORK PERFORMANCE Final Report, 18 Jun. 1984 - 1 Jul. 1985
M. JANGHORBANI Nov. 1985 39 p
(Contract DAMD17-84-G-4012; DA PROJ. 3E1-62777-A-879) (AD-A165325) Avail: NTIS HC A03/MF A01 CSCL 06P

This is the Final Report dealing with development of stable isotope approaches for the study of water-electrolyte balance dynamics in relation to exercise in heat. This progress report describes the development of analytical chemistry of labeled water (H2O18) and rubidium as tracers for the measurement of body water and its dynamics and intracellular mass and its correlates. The methods used in these studies are based on Isotope Ratio Mass Spectrometry (IR/MS) and Inductively Coupled Plasma Mass Spectrometry (ICP/MS). It is shown clearly that both these methods

can be used effectively for simultaneous measurement of body water and body rubidium and their correlates in human adults.
Author (GRA)

N86-26800# Army Research Inst. of Environmental Medicine, Natick, Mass.
PERCEPTUAL AND PHYSIOLOGICAL RESPONSES DURING EXERCISE IN COOL AND COLD WATER
M. M. TONER, L. L. DROLET, and K. B. PANDOLF 1986 11 p (AD-A165491) Avail: NTIS HC A02/MF A01 CSCL 06S

This investigation examined the interaction of exposure to cold water stress with both perceived exertion and thermal sensation during exercise. Eight male volunteers performed arm, leg and combined arm and leg exercise for 45 min in water at 20 and 26 C. Exercise was performed at a low (n = 7) and a high (n = 8) intensity relative to the ergometer specific peak oxygen uptake (VO2 peak). In general, percent VO2 peak did not differ (p greater than 0.05) between type of exercise in either 20 or 26 C water. During low intensity exercise when power output was matched across water temperature (T sub w), percent VO2 peak was greater (P less than 0.05) in 20 C water (52%) compared to 26 C water (42%). Ratings of perceived exertion (RPE) did not differ (p greater than 0.05) between T sub w. During high intensity exercise when percent VO2 peak was matched across T sub w, RPE was low (P less than 0.01) during exercise in 20 C (X = 12.9) compared to 26C (X = 13.9). Multiple correlation analyses comparing both final RPE and thermal sensation (TS) with physiological and thermal measures were performed across type of exercise and T sub w. These data suggest that the change in oxygen uptake associated with exercise in cold water does not add to the overall perception of exertion. This perception appears to be related to cardiopulmonary variables rather than thermal measures, whereas thermal sensation is related to thermal measures and not cardiopulmonary variables.
GRA

N86-26801# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Thermophysiology Group.
INDIVIDUAL PARAMETERS IN THERMOREGULATORY CONTROL; A REVIEW
G. HAVENITH Dec. 1985 86 p Sponsored by Netherlands Central Organization TNO , Delft
(IZF-1985-26; TDCK-86-0429; ESA-86-96943) Avail: NTIS HC A05/MF A01

Variations in human thermoregulatory behavior caused by differences in sex, age, anthropometric measures, hydration state, and circadian rhythm were studied. In order of significance, factors which affect the variations are: state of acclimatization (defined by sweat characteristics); physical fitness (circulatory capacity); hydration state (plasma osmolality and volume); anthropometric measures (body surface, fat, inactive body mass); and time of day.
ESA

N86-26802# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
VISUAL PROTECTION AND ENHANCEMENT
Loughton, England Dec. 1985 230 p refs In ENGLISH and FRENCH Conference held in Athens, Greece, 22-24 Apr. 1985 (AGARD-CP-379; ISBN-92-835-0384-8) Avail: NTIS HC A11/MF A01

Vision is the preeminent sensory channel through which the aviator obtains information necessary for the control of his aircraft and the execution of his operational role. Recognizing this to be important, all reasonable and practical means of enhancing and protecting vision should be adopted. The papers presented considers not only systems for visual protection and enhancement but also addressed the basic physiological and pathological mechanisms underlying existing and future solutions.

N86-26810# Army Aeromedical Research Lab., Fort Rucker, Ala.
AEROMEDICAL LESSONS LEARNED WITH NIGHT VISION DEVICES
D. R. PRICE and W. E. MCLEAN *In* AGARD Visual Protection and Enhancement 10 p Dec. 1985
Avail: NTIS HC A11/MF A01

A review of night vision devices used in the military helicopter flight environment is presented, along with aeromedical lessons learned. Discussion revolves around experience with three U.S. Army aviation systems: the currently used second-generation night vision goggle (NVG), or AN/PVS-5; the soon-to-be-fielded AN/AVS-6 third-generation NVG; and the AH-64 Apache thermal sensor and imaging system. Performance characteristics are presented, and primary emphasis is on aeromedical research related to pilot interface with the systems to include visual acuity, contrast sensitivity, depth discrimination, dark adaptation, crew fatigue, and adaptational problems.
Author

N86-26812# Hamburg Univ. (West Germany). Dept. of Ophthalmology.
PARTICULAR PROBLEMS OF AIRWORTHINESS FROM AN OPHTHALMOLOGICAL VIEW
J. DRAEGER, K. HANKE, and H. WIRT *In* AGARD Visual Protection and Enhancement 3 p Dec. 1985
Avail: NTIS HC A11/MF A01

Navigation of aircrafts depends on visual acuity and optical perception in the main. Therefore ophthalmological evaluation is of major importance in aviation medicine. Each country uses its own national medical standards for the three different pilot classes. But there still remain applicants not exactly meeting these standards. In West Germany, a special expert board is competent for these borderline cases in civil aviation. Some examples are given from the practice of this board showing the particular problems of appropriate decisions. Also the major differences of national regulations between West Germany and the USA are discussed, comparing civil and Air Force standards.
Author

N86-26814# Hamburg Univ. (West Germany). Dept. of Ophthalmology.
NEW GLASSES FOR PRESBYOPIC PILOTS
J. DRAEGER, H. WIRT, and K. HANKE *In* AGARD Visual Protection and Enhancement 3 p Dec. 1985
Avail: NTIS HC A11/MF A01

Presbyopia is a physiological condition starting by an age of about 40 and increasing steadily with age until accommodation ceases around 55. This means that the naked eye is not able to read instruments and charts in near distance. In a fighter cockpit the information of the head-up display is projected on to the windscreen. Therefore, the pilot has to share his attention between infinity and the projected image of the head-up display, focussing and defocussing very quickly between both distances, always looking straight. This reaction slows down with age. In an experimental study an attempt was made to investigate this complex problem and to test certain solutions. A group of untrained presbyopic subjects were asked to perform specifically designed tasks of assembling small parts and were fitted with different multifocal glasses. In three different ranges and different levels, approximately according to the distance in a cockpit, they had to differentiate and to grasp small electronic elements and to fix them on an electronic plate. The time needed and the mistakes were noted and compared. The evaluation showed much better results for those subjects which had with their glasses the greatest visual field for each specific range and level.
E.R.

N86-26815# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France).
CONTACT LENSES FOR PILOTS AND AIRCREW IN THE SERVICES
J. K. CLOHERTY *In its* Visual Protection and Enhancement 12 p Dec. 1985
Avail: NTIS HC A11/MF A01

After working for five years in the contact lens department of Moorsfields Eye Hospital in London and after fitting and monitoring forty volunteers in the RAF Aircrew Soft Contact Lens Trial, it is the opinion of the author that high water content soft contact lenses, or silicone lenses, used as extended wear lenses, are the only contact lenses which are suitable in an aircrew service environment. The fitting and monitoring of such lenses must be carried out by experts in the field of contact lenses. Author

N86-26817# Letterman Army Inst. of Research, San Francisco, Calif.
EFFECTS OF BROAD-BANDED EYE PROTECTION ON DARK ADAPTATION
H. ZWICK, T. A. GARCIA, E. S. BEATRICE, and K. R. BLOOM *In* AGARD Visual Protection and Enhancement 8 p Dec. 1985
Avail: NTIS HC A11/MF A01

Modern combat scenarios require soldiers to perform military tasks under night time conditions. While image enhancement devices are vital to such military performance, unimpaired human night vision retinal mechanisms are essential for performance success. Protection of the human biological sensor is of utmost importance. In this investigation, earlier findings indicating that sunglasses could prevent deleterious effects of bright light on dark adaptation are reexamined. It was found that the use of broad band attenuating spectacles could improve absolute visual thresholds but they had minimal effect on central retinal mechanisms. Dark adaptation functions measured with long wavelength light showed no significant sunglass effect; whereas, such functions measured with intermediate spectral light decreased in final visual thresholds. These differential effects were obtained under environmental light conditions insufficient to produce an evaluation in final visual thresholds for control group subjects not provided with sunglasses. The results strongly support previous arguments for providing standard visible and near ultraviolet protection to personnel required to perform military tasks under extremely bright environmental light. Author

N86-26818# School of Aerospace Medicine, Brooks AFB, Tex.
EYE PROTECTION AGAINST INTENSE LIGHT SOURCES
D. N. FARRER *In* AGARD Visual Protection and Enhancement 3 p Dec. 1985
Avail: NTIS HC A11/MF A01

The assessment of modern techniques for the protection of the eyes against laser radiation must begin with the careful evaluation of these stimuli within the context of impairment of useful work. Occupational safety and health standards were designed to define exposure limits of laser systems to prevent damage. However, an eye hazard may not exist within some exposure conditions (e.g., glare, dazzle, or reversible scotoma) in which functional vision impairment could result in job performance failures. Additionally, eye protection devices should not induce impairment properties. It is within this context that this research program was designed. The identification of laser threats, effects on functional vision and eye protective device properties are important considerations for successful aircrew performance. The vast array of intense light sources which represent threats to functional vision, introduces significant challenges for this research area. Author

N86-26819# WWDBw ABC-Schutz, Munster (West Germany).
CALCULATIONS ON TECHNICAL REQUIREMENTS FOR PROTECTION DEVICES AGAINST A NUCLEAR LIGHT FLASH
W. REHMANN and H. SESTERHENN *In* AGARD Visual Protection and Enhancement 11 p Dec. 1985
Avail: NTIS HC A11/MF A01

Preliminary calculations on the requirements for protective devices against permanent retinal burns caused by nuclear detonations were based on a simplified model which was also used for this study. Computations concerning the reversible flash blindness of flight crews caused by a nuclear explosion is studied as well as the resultant technical requirements to be met by antiflash eye protection systems. In the low yield nuclear range the computations led to shutter times which are technically unfeasible at the present time. Therefore, additional computations were made to determine the periods of blindness occurring when technically feasible antiflash eye protection systems are used. They were then compared with the periods of blindness to be expected under identical conditions but without antiflash eye protection systems. Author

N86-26821# Naval Air Development Center, Warminster, Pa. Life Sciences Research Group.
THE APPLICATION OF DIFFRACTION OPTICS TECHNIQUES TO LASER EYE PROTECTION
G. T. CHISUM *In* AGARD Visual Protection and Enhancement 4 p Dec. 1985
Avail: NTIS HC A11/MF A01

Development of a method of protecting the eyes of military personnel from laser radiation has been pursued for a number of years. The devices developed have marginal acceptability, particularly for aircrew personnel. Efforts underway to develop a holographic diffraction grating protection device indicate that such a device is feasible and that the requirements of high transmittance, multiple wavelength rejection and configuration suitable for aircrew use can be met. Author

N86-26822# Letterman Army Inst. of Research, San Francisco, Calif.
FOVEAL FLASHES AND HUMAN PERFORMANCE
D. I. RANDOLPH, E. T. SCHMEISSER, and E. S. BEATRICE *In* AGARD Visual Protection and Enhancement 6 p Dec. 1985
Avail: NTIS HC A11/MF A01

The role of several variables in the production of a flash which would reduce the ability of humans to detect and discriminate targets, functions which are required of both air and ground troops is determined. Four volunteers were exposed to xenon gas discharge tubes with different retinal spot sizes and flash durations. The task consisted of a reaction time experiment in which the subjects detected both the presence and orientation of a striped grating which subtended 0.57 deg at the retina. Three grating contrasts at three pattern-background contrasts were presented in a pseudo random order. Three flash conditions were used. The results showed that the larger image size and longer flash durations produced significantly poorer performance on both the detection and discrimination tasks. For the smallest retinal spot size, and the shortest flash condition, the detection but not the discrimination times were faster than the nonflash trials. This indicated that while the flash may have acted as a preparatory signal, more complex pattern processing remained sensitive to the flash. Author

N86-26823# Letterman Army Inst. of Research, San Francisco, Calif.
PERMANENT VISUAL CHANGE ASSOCIATED WITH PUNCTATE FOVEAL LESIONS
H. ZWICK, K. R. BLOOM, and E. S. BEATRICE *In* AGARD Visual Protection and Enhancement 8 p Dec. 1985
Avail: NTIS HC A11/MF A01

In order to understand battlefield hazards of laser exposure under field conditions, it has been necessary to evaluate effects of small punctate foveal lesions on visual function of nonhuman primates. Previous experiments have found a correlation between functional loss and foveal damage. The present investigation

showed that detecting the effects of small foveal lesions is not an easy task. From the results, the possibility that considerable foveal damage could occur before a measurable change in visual function could be detected with presently available visual function testing procedures is apparent. It is recommended that more sensitive visual function test procedures, such as clinical tests that measure both spectral and spatial resolution under threshold contrast conditions. Author

N86-27870# Joint Publications Research Service, Arlington, Va.
LACTOBACTERIA AND PROPHYLAXIS IN SPACE
I. IVANOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 1 9 May 1986 Transl. into ENGLISH from Tass (Tartu, USSR), 11 Mar. 1986
Avail: NTIS HC A07/MF A01

Cosmonauts on long duration space flights face health hazards in the form of pathogenic bacteria. Lactobacteria increase the resistance of the body to disease and kill agents responsible for many diseases. The lactobacteria have the capacity to stick to the cell of the human body and thus make them invulnerable to pathogenic microbes. The lactobacteria preparation replenishes the loss of the bacteria in the human body and stimulates the immune system. The use of these microorganisms institutes an ecological barrier protecting man. B.G.

N86-27872# Joint Publications Research Service, Arlington, Va.
SWEATING REFLEX IN COMPLEX OF METHODS FOR EVALUATING OPERATOR EFFICIENCY
P. P. SLYNKO, L. I. BUKVAREVA, S. V. ZAPOROZHETS, and P. M. ONISHCHENKO *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 46 9 May 1986 Transl. into ENGLISH from Fiziologicheskiy Zhurnal (Kiev, USSR), v. 31, no. 6, Nov. - Dec. 1985 p 678-682 Original language document was announced as A86-21453
Avail: NTIS HC A07/MF A01

A method for measuring the electrodermal characteristics associated with the stress induced diaphoretic reflex was developed. The method is intended for use in evaluating the functional conditions of a human operator in monotonous work conditions. A general description of the diaphoretic skin sensor is give, and experimental results are presented concerning the accuracy of the method in comparison to conventional electrodermal sensing methods. It is shown that, in contrast to conventional methods, the present sensing method offers a highly reliable measure of skin response over extended periods of monotonous work. I.H.(IAA)

N86-27874# Joint Publications Research Service, Arlington, Va.
EFFECTS OF COLD EXPOSURE ON THERMAL STATUS OF MEN AND WOMEN
R. F. AFANASYEVA and R. O. OGANYAN *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 100 9 May 1986 Transl. into ENGLISH from Gigiyena Truda i Professionalnyye Zabolevaniya (Moscow, USSR), no. 1, Jan. 1986 p 24-28
Avail: NTIS HC A07/MF A01

Sex differences in thermal confort perception and objective changes in skin temperature and heat loss on exposure to different environmental temperatures were assessed in 8 men and 9 women between the ages of 20 and 35 years. In conjecture with the objective data that thermoregulation in women relies essentially on physical factors (decreased skin temperature and diminished body heat loss), women were quicker to perceive thermal discomfort. In men, thermal homeostasis relied preferentially on chemical thermoregulation reflected in greater heat loss. B.G.

N86-27875# Joint Publications Research Service, Arlington, Va.
STUDY OF BRAIN BIOCHEMISTRY DURING HYPOTHERMIA
E. E. EMIRBEKOV and S. P. LVOVA *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 101 9 May 1986 Transl. into ENGLISH from Kriobiologiya (Kiev, USSR), no. 1, 1985 p 44-49
Avail: NTIS HC A07/MF A01

Aspects of cerebral metabolism in hibernating and non-hibernating animals during hypothermia are discussed and analyzed on the basis of literature survey. Existing factual materials on neurochemical changes in the brain due to hypothermia cannot support formulation of a fully developed theory of the effect of cooling on cerebral metabolism. There are many gaps in the area of neuro-specific components and their role in hypothermia. A specific concept of the effect of hypothermia on molecular processes in the brain is described briefly. Existence of reserve possibilities of regulatory processes in the central nervous system during hypothermia is indicated and prospects are presented for extending resistance of warm blooded animals to hypothermia by use of adaptive functions at low body temperatures. Author

N86-27876# Joint Publications Research Service, Arlington, Va.
SOMATOSENSORY AND AUDITORY PERCEPTION ACCORDING TO STUDY USING FOCUSED ULTRASOUND
Y. M. TSIRULNIKOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-008) p 102 9 May 1986 Transl. into ENGLISH from Zhurnal Evolyutsionnoy Biokhimii i Fiziologii (Leningrad, USSR), v. 21, no. 6, Nov. - Dec. 1985 p 591-596
Avail: NTIS HC A07/MF A01

Materials from literature are used in discussion of aspects of the interpenetration of physiology and psychology in the area of sensory preception with emphasis on the contribution of somatosensory and auditory systems with the aid of focused ultrasound. Characteristics of distribution of sensitivity in the skin surface and in deep tissues are described and discussed. Specific feature of sensitivity in biologically active points are considered. The advisability of isolating elementary sensation and considering its role in formation of a sensory image was indicated. Artificial formation of samples, especially single-model samples such as tactile, temperature or auditory modes was found to be helpful since such a model can be controlled to a great degree with the aid of focused ultrasound and other artificial stimuli. Author

N86-27879# Joint Publications Research Service, Arlington, Va.
PROSPECTS FOR USING ULTRAVIOLET RADIATION IN LONG-TERM SPACEFLIGHTS
N. Y. PANFEROVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 1-13 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 4-12
Avail: NTIS HC A08

The data concerning UV-effects on the human body and the environment are reviewed as applied to long term flights. It is concluded that UV-radiation can be used in long term spaceflights in view of its vitamin forming, desensitizing, bactericidal and supporting properties to improve the environment and to prevent adverse effects of spaceflight factors. Author

N86-27880# Joint Publications Research Service, Arlington, Va.
EXPERIMENTAL AND GENERAL THEORETICAL RESEARCH: NATURE OF CIRCULATORY REGULATION IN PILOTS
V. G. DOROSHEV, Z. A. KIRILLOVA, and A. P. VANARSHENKO *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 14-18 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 12-15
Avail: NTIS HC A08

Dynamic observations over a group of pilots within a working week during three months have shown that blood pressure increases to meet the requirements via higher cardiac output. When

stresses grow and fatigue sets in, the pattern of circulation regulation changes so that elevated blood pressure is maintained due to an increased peripheral resistance. Differential approach to the pattern of blood pressure regulation makes it possible to assess the degree of circulation adaptation to various work loads. Author

N86-27882# Joint Publications Research Service, Arlington, Va.
EFFECT OF INTENSIVE OPERATOR WORK ON LIPID PEROXIDATION PROCESSES IN MAN
S. M. IVANOVA, O. N. ORLOV, S. S. BRANTOVA, O. I. LABETSKAYA, N. A. DAVYDOVA, A. Y. ZEZEROV, and A. S. USHAKOV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 25-28 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 20-22
Avail: NTIS HC A08

It was demonstrated that the stress associated with an active mental work for 2 hours leads to a high rate of lipid peroxidation which results in a greater amount of products of lipid peroxidation in blood and pentane in exhaled air. Simultaneous measurements of blood catecholamines have shown their significant increase immediately after exposure to the stress effect. It can therefore be concluded that a stress situation enhances lipid peroxidation in the human body. Author

N86-27884# Joint Publications Research Service, Arlington, Va.
DISTINCTIONS IN HUMORAL CONTROL OF METABOLISM WITH SIMULATION OF SPACEFLIGHT FACTORS
S. KALANDAROV, V. P. BYCHKOV, I. D. FRENKEL, and G. I. PROSKUROVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 34-38 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 25-28
Avail: NTIS HC A08

Hormonal regulation of metabolism was investigated in test subjects of three age groups: group 1 included test subjects of 41 to 50 years old, group 2 test subjects of 50 to 57 years old, and group 3 test subjects of 26 to 33 years old. Test subjects from groups 1 and 2 were exposed to head down tilt as well as linear acceleration of 3 Gz for 1 min and exercises of 450 to 1050 kgm before and after the tilt test. Group 3 test subjects were exposed to neuroemotional stress before, during and after the head down test. Exposure to head down tilt, acceleration and exercises caused adaptive changes in humoral regulation of metabolism in the test subjects of groups 1 and 2. Food supplements given to group 3 test subjects produced a normalizing effect on humoral regulation of metabolism. Author

N86-27885# Joint Publications Research Service, Arlington, Va.
SOME HUMAN REACTIONS DURING 7-DAY ANTIORTHOSTATIC HYPOKINESIA
B. F. ASYAMOLOV, V. S. PANCHENKO, V. A. KARPUSHEVA, R. A. BONDARENKO, O. A. VOROBYEV, V. V. ZARITSKIY, V. P. STUPNITSKIY, I. G. POPOV, P. A. LOZINSKIY, and S. M. LEDOVSKOY *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 39-44 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 29-32
Avail: NTIS HC A08

Time-course variations in the cardiovascular parameters, vestibulo-autonomic stability, work capacity and nutritional status were measured in 20 male test subjects, aged 19 to 22, who were exposed for 7 days to head down tilt. Beginning with days 3 or 4, new hemodynamic ratios developed that indicated a new level of circulation regulation and adaptation to head down tilt. It appears that blood redistribution towards the head led to an enhanced vestibulo-autonomic stability. Renal excretion of nitrogen increased, reaching the highest level on days 6 to 7. The investigations allow the conclusion that 7-day head down tilt may cause changes in almost every physiological system. Author

N86-27887# Joint Publications Research Service, Arlington, Va.
HUMAN CENTRAL HEMODYNAMICS DURING LOWER LIMB DECOMPRESSION
V. V. RUMYANTSEV and V. Y. KATKOV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 49-52 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 35-37
Avail: NTIS HC A08

Experiments were performed to study the effect of leg decompression in the head down position at -15 deg. The method of chronic catheterization was used, pressure was measured in different areas of the cardiovascular system, blood was withdrawn for biochemical analysis. The effect of leg decompression was compared with that of lower body negative pressure. Decompression produced changes in Pressure in Pulmonary (PAP) and Central Venous Pressure (CVP) that were similar in sign but different in magnitude. The decompression induced changes in PAP and CVP were primarily determined by the area of exposure. Using previous data, a nomograph was constructed to evaluate PAP and CVP variations as a function of the decompression mode and site. Author

N86-27888# Joint Publications Research Service, Arlington, Va.
PHASIC PROCESSES IN KINETICS OF FORMED BLOOD ELEMENTS
V. V. VERIGO and F. GAUSER *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 53-58 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 38-41
Avail: NTIS HC A08

When quantitating blood shifts in response to environmental effects, it is important to take into account the phasic pattern of certain processes. Theoretical considerations and experimental data on the fluctuations of the counts of formed elements have been published. Since the fluctuations cannot be easily detected by experimental methods, they can be investigated using mathematical modeling. A model describing the counts of red blood cells and their precursors in relation to the age structure of the population was developed. Depending on the oxygen requirements and physiological parameters, humoral regulation controls cell proliferation and release into the functioning pool. The model allows for incidental hemolysis as well as for lifetime of red blood cells. Simulation of various processes in the blood system when exposed to unusual environmental effects has shown that some of the processes can be phasic in character. Author

N86-27892# Joint Publications Research Service, Arlington, Va.
T AND B COMPONENTS OF IMMUNITY IN THE PRESENCE OF ACUTE MOUNTAIN SICKNESS
M. M. MIRRAKHIMOV, M. I. KITAYEV, R. O. KHAMZAMULIN, A. G. TOKHTABAYEV, and S. M. POGREBITSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 79-84 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 53-56
Avail: NTIS HC A08

Immunological aspects of the adaptation process were investigated in 57 male test subjects that stayed for 30 days at an altitude of 3600 m above sea level. The uneventful development of adaptation was accompanied by a short term decrease in the number and activity of T-lymphocytes. An acute mountain disease led to a distinct deficiency of T-cell immunity which still persisted on test day 30. Besides, the content of zero cells in circulating blood was increased and the blast-transformation reaction of lymphocytes to concavalin A was inhibited. Prior to the ascent the test subjects who were susceptible to the acute mountain

disease showed a lower content of T-lymphocytes and a higher content of zero cells in circulating blood. Author

N86-27893# Joint Publications Research Service, Arlington, Va.
EFFECT OF DIFFERENT DOSES OF ULTRAVIOLET RADIATION ON VITAMIN LEVELS IN MAN
M. S. BELAKOVSKIY, M. G. YUZHANSKAYA, N. Y. PANFEROVA, L. K. PASTUSHKOVA, O. G. PEREVERZEVA, A. N. SMIRNOVA, I. N. SERGEYEV, and V. B. SPIRICHEV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 85-91 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 56-61
Avail: NTIS HC A08

Exposure of healthy adults to prophylactic doses of UV radiation in the medium and long wavelength spectrum improved metabolism of vitamins A, E and D and increased their content in the body. UV irradiation even in prophylactic doses increased ascorbic acid requirements. Excessive UV radiation produced an adverse effect on the vitamin content. However, the vitamin concentration in blood was not significantly decreased. This can be explained by the adaptation of the human body to UV-irradiation upon a continuous increase of its dosage. Author

N86-27895# Joint Publications Research Service, Arlington, Va.
RADIOBIOLOGICAL VALIDATION OF QUALITY FACTOR OF PROTONS AND HELIUM IONS
N. I. RYZHOV and B. S. FEDORENKO *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 95-99 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, Jan. - Feb. 1986 p 63-66
Avail: NTIS HC A08

Reported data and experimental results of measuring the relative biological effectiveness of protons of different energies and helium ions of 4 GeV/nuclon were analyzed to determine quality factors of the major components of cosmic radiations. It is recommended to use quality factors equal to 1.30 to 1.45 for 100 to 730 MeV protons and equal to 1.75 for 9 GeV protons and 4 GeV/nuclon helium ions. It is also suggested to employ them as standards for solving practical problems of radiation safety in spaceflights. Author

N86-27899# Joint Publications Research Service, Arlington, Va.
METHOD OF DEMONSTRATING CALCIUM IN HUMAN FOOT BY NEUTRON ACTIVATION OF (ALPHA, N)-SOURCES
V. Y. ZAYCHIK, A. Y. KONDRASHOV, and B. V. MORUKOV *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 113-119 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, Jan. - Feb. 1986 p 75-78
Avail: NTIS HC A08

Bone demineralization during long term exposure to weightlessness and hypokinesia is presently a universally recognized fact. However, it should be noted that quantitatively incomparable results were obtained with use of different methods (X-ray densitometry, photon absorptiometry, X-ray tomography) to determine mineralization of bone. Evidently, this is attributable to the fact that they yield only an indirect estimate of the state of the mineral matrix of bone, since they characterize a parameter inherent in bone tissue as a whole, namely, the degree of absorption of photons of X-ray and gamma ranges of energy. Availability of this information alone does not allow one to draw a strictly quantitative conclusion about one of the important features of the mineral matrix, the concentration of calcium. Recording mesoroentgen radiation during exposure of some parts of the skeleton, for example, the calcaneus, to mu-mesons is a promising procedure for development of a method of direct measurement of the main mineral constituents of bone. However, there is still much to be done in this direction, and it is difficult to execute such a measuring method, as well as to make a quantitative interpretation of the obtained results. A description of the in vivo NAA method for Ca level in the human foot is presented. Special investigations had to be conducted to optimize irradiation conditions and spectrometry, as well as develop special equipment, in order to reach the goal of no more than 0.05 relative total error of each individual measurement with an equivalent dose or no more than 3 rem. E.R.

N86-27901# Joint Publications Research Service, Arlington, Va.
AMINO ACID SPECTRUM OF HUMAN BLOOD IN THE PRESENCE OF EMOTIONAL STRESS
T. F. VLASOVA, A. S. USHAKOV, V. P. BYCHKOV, and Y. B. MIROSHNIKOVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 123-125 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 80-82
Avail: NTIS HC A08

The results of assaying the amino acid spectrum of human blood with simulation of stress situations similar to the professional activities of cosmonauts are presented. Methods and results are discussed. Author

N86-27902# Joint Publications Research Service, Arlington, Va.
BLOOD SERUM ENZYMES DURING 7-DAY WATER IMMERSION
T. Y. DROZDOVA and Y. G. VETROVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - Februar, 1986 (JPRS-USB-86-003) p 126-128 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 82-83
Avail: NTIS HC A08

During submersion in water the body is exposed to a number of factors, among which redistribution of blood and lack of load on the locomotor system are rather important. This could affect metabolism of skeletomuscular tissue and parenchymatous organs, analogous to the effect of weightlessness. Investigation of changes in blood serum enzyme spectrum enables the demonstration, with some degree of certainty, the direction of metabolic transformations in different tissues and organs in weightlessness. Author

N86-27904# Joint Publications Research Service, Arlington, Va.
RADIOPROTECTIVE AND THERAPEUTIC EFFICACY OF CARRAGEENAN AGAINST PROTON RADIATION
K. S. CHERTKOV, N. I. GVOZDEVA, B. S. FEDORENKO, and Y. Y. PREOBRAZHENSKIY *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 132-135 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 84-86
Avail: NTIS HC A08

Assurance of radiation safety of long term spaceflights is one of the important tasks put to space biology and medicine. In this regard, importance is attributed to refinement of technical equipment, search and development of effective drugs. It is known that the danger of irradiation, mainly from high energy protons, is higher in long term spaceflights. It was deemed desirable to investigate the radioprotective properties of some previously tested radioprotective agents, for example, carrageenan, during exposure to protons. E.R.

N86-27905* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Dec. 1985 81 p
(NASA-SP-7011(278); NAS 1.21:7011(278)) Avail: NTIS HC A05 CSCL 06E

This bibliography lists 237 reports, articles, and other documents introduced into the NASA scientific and technical information system in November 1985. Author

N86-27906# Electrotechnical Lab., Ibaraki (Japan).
STUDIES ON VISUAL INFORMATION PROCESSING IN RETINAL NEURONS
M. YAMADA Oct. 1985 78 p In JAPANESE; ENGLISH summary
(EL-859; ISSN-0366-9106; UDC-612.843:681.3) Avail: NTIS HC A05/MF A01

In the retina a great deal of information is processed. A negative feedback hypothesis in synaptic mechanisms explaining color information processes in retinal neurons was not proved physiologically in spite of being supported by histological findings. In order to know the characteristics of visual information processing, the relationship between photostimulus and electric response of cells, particularly, the response dynamics was investigated. A linear response analysis method was applied to the neural network in a retina. The effects of light adaptation on the waveforms of oscillatory potentials found in photoresponses of rods were examined. The relationship between rod and cone neural pathways was studied. The responses of second neurons to photostimulus at receptor cells was also examined. B.G.

N86-27907# Electrotechnical Lab., Ibaraki (Japan).
STUDIES ON ACCURATE MEASUREMENTS AND ANALYSES OF HUMAN OLFACTORY EVOKED POTENTIALS
M. TONOIKE Jan. 1986 86 p In JAPANESE; ENGLISH summary
(EL-863; ISSN-0366-9106; UDC-612.86:6512.825.5:159.933)
Avail: NTIS HC A05/MF A01

Several techniques were developed to measure human olfactory evoked potentials (OEPs). Waveforms of the OEPs were recorded when perceived. Techniques for rejecting the contaminants and preventing various kinds of noise are described. The saturation phenomenon is discussed with respect to the amplitude of OEPs for repeated pulse stimuli. Psychological studies on the scaling structure of odors were performed to compare the waveforms of OEPs with the psychological data of olfaction. Waveform of OEPs for various odorants were measured. The singualr value decomposition (SVD) method is applied to analyze the waveforms. The correlation of the response peak of OEPs at 300 milliseconds with the P300 response of the event related potential was discussed. B.G.

N86-27908# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
ELEMENTS OF RADIATION PROTECTION
M. BELLI, S. FRULLANI, F. V. ORESTANO, and G. CAMPURRA 15 Nov. 1985 101 p In ITALIAN; ENGLISH summary Seminar held in Rome, Italy, 21-23 Nov. 1983
(ISS-L-84/7; ISSN-0390-6493; ESA-86-97079) Avail: NTIS HC A06/MF A01

The biological effects of radiation, health effects of radiation, and the physical and medical aspects of radiation protection are discussed.
ESA

N86-27909# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
BIOLOGICAL EFFECTS OF IONIZING RADIATION [EFFETTI BIOLOGICI DELLE RADIAZIONI IONIZZANTI]
M. BELLI *In its* Elements of Radiation Protection 28 p 15 Nov. 1985 In ITALIAN
Avail: NTIS HC A06/MF A01

The processes leading to damage of living cells by ionizing radiation are reviewed. The discussion includes the definitions of relative biological effectiveness and linear energy transfer; a description of the primary processes and the effects on lipids, proteins and DNA; the DNA self-repairing processes; and theories of damaging mechanisms. It is concluded that DNA is the main target for permanent biological damage, which is a function of initial damage and recovery capacity. It is shown that mutation mechanisms where the effect-dose ratios do not show a threshold are relevant to genetic and cancerogenic effects. ESA

N86-27910# Istituto Superiore di Sanita, Rome (Italy). Lab. di Fisica.
EFFECTS OF RADIATION HEALTH [EFFETTI SANITARI DELLE RADIAZIONI]
S. FRULLANI *In its* Elements of Radiation Protection 45 p 15 Nov. 1985 In ITALIAN
Avail: NTIS HC A06/MF A01

The measurement of radiation parameters such as relative biological effectiveness and linear energy transfer, and the clinical effects of radiation as dependent of dose and type are reviewed in order to assess criteria for a radiation health policy. Stochastic and threshold effects are discussed. The protective regulations existing in the European Community are examined. It is shown that the dose limits are chosen to give a risk limit of one per thousand per year, that is ten times the amount corresponding to low risk professions. ESA

N86-27911# Calabria Univ., Cosenza (Italy).
OPERATING RADIATION PROTECTION: PHYSICAL ASPECTS [RADIOPROTEZIONE OPERATIVA: ASPETTI FISICI]
F. V. ORESTANO *In* Istituto Superiore di Sanita Elements of Radiation Protection 10 p 15 Nov. 1985 In ITALIAN
Avail: NTIS HC A06/MF A01

The categories of radiation distinguished by Italian law and the function of the radiation expert required by Italian legislation to check working areas with a radiation hazard potential are examined. The details of the regulations are discussed and the full text of several norms is presented. ESA

N86-27912# European Nuclear Energy Agency, Frascati (Italy).
OPERATING RADIATION PROTECTION: MEDICAL ASPECTS [RADIOPROTEZIONE OPERATIVE: ASPETTI MEDICI]
G. CAMPURRA *In* Istituto Superiore di Sanita Elements of Radiation Protection 12 p 15 Nov. 1985 In ITALIAN
Avail: NTIS HC A06/MF A01

The duties of medical personnel working with radiation exposed workers are described. The nature of preliminary medical evaluations are explained, showing that the main goal is to determine workers' ability to support radiation risk and to identify as early as possible any pathological condition due to radiation or implying a physiological reduction of radiation resistance. Clinical examinations to be performed are classified and discussed. Italian regulations are included. ESA

N86-27913*# Arizona Water Resources Research Center, Tucson. Dept. of Physiology.
EFFECTS OF MUSCLE ATROPHY ON MOTOR CONTROL Final Technical Report, 1 Jun. 1982 - 31 May 1985
D. G. STUART 1985 22 p
(Contract NAGW-338)
(NASA-CR-177201; NAS 1.26:177201) Avail: NTIS HC A02/MF A01 CSCL 06P

As a biological tissue, muscle adapts to the demands of usage. One traditional way of assessing the extent of this adaptation has been to examine the effects of an altered-activity protocol on the physiological properties of muscles. However, in order to accurately interpret the changes associated with an activity pattern, it is necessary to employ an appropriate control model. A substantial literature exists which reports altered-use effects by comparing experimental observations with those from animals raised in small laboratory cages. Some evidence suggests that small-cage-reared animals actually represent a model of reduced use. For example, laboratory animals subjected to limited physical activity have shown resistance to insulin-induced glucose uptake which can be altered by exercise training. This project concerned itself with the basic mechanisms underlying muscle atrophy. Specifically, the project addressed the issue of the appropriateness of rats raised in conventional-sized cages as experimental models to examine this phenomenon. The project hypothesis was that rats raised in small cages are inappropriate models for the study of muscle atrophy. The experimental protocol involved: 1) raising two populations of rats, one group in conventional (small)-sized cages and the other group in a much larger (133x) cage, from weanling age (21 days)

through to young adulthood (125 days); 2) comparison of size- and force-related characteristics of selected test muscles in an acute terminal paradigm. Author

N86-27914# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCERNING BAROTRAUMA OF THE LUNGS-TRANSLATION
G. KHRISTOV 5 Feb. 1986 20 p Transl. into ENGLISH from Khirurgiya (Bulgaria), v. 22, no. 6, 1969 p 589-597
(AD-A165006; FTD-ID(RS)T-1143-85) Avail: NTIS HC A02/MF A01 CSCL 06E

The popularization and development of skin diving has led to the appearance of a new type of trauma of the lungs, caused by rapid change in air pressure in the lungs during sudden ascent of the diver with the breath held. Barotrauma of the lungs may be occasionally observed in anesthesiological practice as well. The paper discusses the etiopathogenesis, clinical manifestations and treatment of the complaint. The author has observed and described three cases of barotrauma of the lungs, one of which ended in death. It is emphasized that effective treatment of pulmonary barotrauma is feasible only when a barochamber is available, large enough to accommodate the performance of resuscitation and, if necessary, surgical interventions. GRA

N86-27915# School of Aerospace Medicine, Brooks AFB, Tex.
SOFT CONTACT LENS WEAR DURING +G(Z) ACCELERATION Final Report, Oct. 1982 - Jun. 1985
W. J. FLYNN, M. G. BLOCK, W. F. PROVINES, T. J. TREDICI, and R. D. KULLMAN Dec. 1985 23 p
(AD-A165013; USAFSAM-TR-85-84) Avail: NTIS HC A02/MF A01 CSCL 17H

The effects of +G sub z on soft contact lens wear are reported here. Human centrifuge rides up to +8 G sub z were accomplished on 11 subjects. Six myopic subjects were tested with low-, medium-, and high-water-content spherical soft lenses. Two astigmatic subjects were tested with various designs of toric soft lenses. In addition, the contact lens subjects were tested with spectacles for comparison. Three emetropic subjects served as controls. Video photography was used to monitor lens position during the centrifuge rides; and visual acuity was checked at +1, +2, +4, +6 and +8 G sub z with a reduced Snellen eye chart. Each lens type and control run was evaluated in straight-ahead, lateral, and vertical gaze. No significant decentration was noted for any of the lens types tested up to the maximum level of +8 G sub z. Visual acuity was reduced at the higher +G sub z levels for contact lenses, and spectacle trials, and with the emmetropic controls--all to similar levels. Contact lens did not produce any corneal insult due to the +G sub z exposure. Author (GRA)

N86-27916# Army Research Inst. of Environmental Medicine, Natick, Mass.
INFLUENCE OF ERYTHROCYTHEMIA ON BLOOD VOLUME AND THERMOREGULATION DURING EXERCISE-HEAT STRESS
M. N. SAWKA, R. C. DENNIS, R. R. GONZALEZ, A. J. YOUNG, and S. R. MUZA 1986 31 p
(AD-A165[illegible].4; USARIEM-M-13/86) Avail: NTIS HC A03/MF A01 CSCL 06S

We studied the effects of autologous erythrocyte infusion on blood volume and thermoregulation during exercise in the heat. Using a double blind design, nine unacclimated male subjects were infused with either 700 ml of a NaC1 glucose-phosphate solution containing a approx. 60% hematocrit (n=6, reinfusion) or 700 ml of this solution only (n=3, saline). A heat stress test (HST) was attempted approximately 2 wk pre-and 48 h post-infusion during the late spring months. After 30 min of rest in a 20 C antechamber, the HST consisted of a 120-min exposure (two repeats of 15-min rest and 45-min treadmill walking) in a hot (35c, 45% rh) environment while euhydrated. Red cell volume (RCV, 51 CR) and plasma volume (PV, 125I) were measured 24-h before each HST, and maximal oxygen uptake (VO2 max) was measured 24-h after each HST. Generally, no significant effects were found for the saline group. For the reinfusion group, RCV (11%, $P<0.01$) and V02 max (11%, $P<0.05$) increased after infusion, and the following observations were made: (1) the increased RCV was associated with a reduction in PV to maintain the same blood volume as during the preinfusion measurements; (2) erythrocythemia reduced total circulating protein, but did not alter F-cell ratio, plasma osmolality, plasma protein content, or plasma lactate at rest or during exercise-heat stress; (3) erythrocythemia did not change the volume of fluid entering the intravascular space from rest to exercise-heat stress. GRA

N86-27917# Army Research Inst. of Environmental Medicine, Natick, Mass.
URINARY AND HEMATOLOGICAL INDICES OF HYPOHYDRATION
R. P. FRANCESCONI, R. W. HUBBARD, P. C. SZLYK, D. SCHNAKENBERG, and D. CARLSON 1986 22 p
(AD-A165015; USARIEM-M-15/86) Avail: NTIS HC A02/MF A01 CSCL 06S

As part of a large scale field feeding system test we had the unique opportunity to collect and study hundreds of overnight urine aliquots which were obtained immediately prior to a fasting blood sample on days 1, 20, and 44 of the field test. To evaluate the hydrational status of test subjects and criteria of hypohydration, urine aliquots were categorized by specific gravity $>$ or $=$ 1.03 ($n=124$) or $<$ 1.03 ($n=540$). Creatinine levels were elevated ($p<.001$) in the concentrated urine samples, but a decreased trend in Na(+)/K(+) ratios in these samples failed to achieve statistical significance ($p=0.1$). However, when individuals with high specific gravity urine were further subclassified by a criterion of weight loss $>$ 3% from original body weight, then creatinine concentrations were elevated ($p=.05$) while Na(+)/K(+) ratios were decreased ($p=.05$) when compared with levels in subjects also with high specific gravity but weight loss $<$ 3%. Serum urea nitrogen/creatinine ratios were significantly increased (days 1 and 44, $p=.02$) in test subjects whose urine samples exceeded 1.03 in specific gravity. The results of this study indicated that prodromal hypohydration, indicated by concomitant elevations in urinary specific gravity and creatinine, was not reflected in the common indices of circulatory hypohydration- hematocrit and osmolality. Alternatively, urea nitrogen/creatinine ratio may be a sensitive circulatory index of imminent hypohydration. GRA

N86-27918# Health Effects Research Lab., Research Triangle Park, N. C.
FACTORS INFLUENCING CARBOXYHEMOGLOBIN STABILITY Final Report, 1983 - 1984
G. M. GOLDSTEIN, L. RAGGIO, and D. HOUSE 26 Mar. 1985 39 p Prepared in cooperation with Rockwell International Corp., Chapel Hill, N.C.
(AD-A165032; TR-1811) Avail: NTIS HC A03/MF A01 CSCL 06A

Carbon monoxide (CO) is a byproduct of the incomplete combustion of hydrocarbons. Because of its high affinity for oxygen binding sites on hemoglobin and displacing oxygen, the presence of CO in the atmosphere has been shown to produce adverse health effects, affecting the cardiovascular system as well as causing behavioral changes. These changes have been reported at concentrations of carboxyhemoglobin (COHB) in the range of 4 to 6%. The Department of Defense (DOD) is concerned about the production of CO in fixed and mobile weapon systems and the relationship between behavior and health effects in military personnel associated with this exposure. The source of CO in a combat situation is exhaust gases from motorized vehicles and propellant gases from weapon systems. Studies were conducted to determine the stability of carboxyhemoglobin (COHb) in evacuated blood containers using the IL-282 co-oximeter as the measurement instrument. This study has shown that COHb levels decrease by 5 to 10% of the original value after three days of storage and remain stable for 14 days at 4 C or 21 C in vacutainers containing heparin or EDTA. The storage temperature, 4 C or 21 C had no appreciable affect on COHb levels. Blood samples that contained the anticoagulant heparin had higher initial values of COHb than samples with EDTA. In this study ambient room light

levels did not affect the measured levels of COHb at 4C for 5 days. GRA

N86-27919# Texas Univ., Arlington. Dept. of Psychology.
EFFECTS OF ATROPINE SULFATE ON AIRCREW PERFORMANCE Final Report, Mar. 1983 - Apr. 1985
M. L. LOBB, J. D. PHILLIPS, JR., and A. S. WINTER Dec. 1985 16 p
(Contract F33615-83-K-0611)
(AD-A165063; USAFSAM-TR-85-48) Avail: NTIS HC A02/MF A01 CSCL 06O

The human/animal literature on performance effects of atropine sulfate is reviewed and extrapolated to aircrew requirements. Subjective reports and physiological dose-response curves are used to estimate effective dosage levels for performance; ED50 is the dose at which 50% of an aircrew experiences a detectable performance change. Based on this review and extrapolation, the ED40 level for atropine sulfate is 2 mg IM/person for performance effects on near vision, alertness, equilibrium, response-force discrimination, and enunciation: the ED5 level is estimated at 1.35 mg IM/person. Although the published literature on simultaneously administered acetylcholinesterase inhibitors and blockers is insufficient to warrant even a tentative conclusion, the initial results suggest a combined mode of action in the visual system; if confirmed, such action would limit the use of atropine to counteract chemical-warfare performance decrements. Thus although atropine may be lifesaving, it does not prevent aircrew performance losses due to chemical-warfare agents and may impose additional decrements. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-37276
THE STRESS SYNDROME
F. SANDERS and J. ETHELL Cockpit (ISSN 0742-1508), Jan.-Mar. 1986, p. 5-11.

The effects of extended acute stress on the performance of pilots are analyzed. The symptoms of stress which include reduced cognitive capability, failure to perceive passage of time, personality change, tunnel vision, detachment from the situation, and uncontrolled shaking are described. The influence of stress-induced endorphin on the synaptic gap function of the brain is studied. Methods of relieving or 'preburning' stress are examined. The need for self-monitoring of stress is discussed. I.F.

A86-38984
DESIGNING THE CONDITIONS OF LIFE AND WORK OF COSMONAUTS (2ND REVISED AND ENLARGED EDITION) [PROEKTIROVANIE USLOVII ZHIZNI I RABOTY KOSMONAVTOV /2ND REVISED AND ENLARGED EDITION/]
N. N. GUROVSKII, F. P. KOSMOLINSKII, and L. N. MELNIKOV Moscow, Izdatel'stvo Mashinostroenie, 1985, 152 p. In Russian. refs

The factors that influence cosmonauts in space are analyzed. The basic spacecraft design and work of the cosmonauts are described. The effects of cabin conditions on crew life during long space flights are investigated. The organization of the crews' cabin and methods of increasing the cosmonauts work efficiency are discussed. Psychological and physiological stresses due to space flight are studied. I.F.

N86-26826 Groningen Rijksuniversiteit (Netherlands). Traffic Research Center.
DRIVING PERFORMANCE THE DAY AFTER USE OF LOPRAZOLAM, FLUNITRAZEPEM AND PLACEBO
E. R. VOLKERTS, G. DEVRIES, T. MEIJER, and J. F. OHANLON Jun. 1984 66 p Revised Sponsored in part by Netherlands' Ministerie van Onderwijs en Weitenschappen and Roussel-UCLAF, France
(VK-83-04; ISBN-90-6807-005-3; B8561714; ISSN-0167-8590; ESA-86-96948) Avail: Issuing Activity

In order to determine if loprazolam, a mild hypnotic drug, has residual effects on driving performance and if a dose-effect relationship exists, 16 female subjects performed a driving test in 1 of 4 conditions. Loprazolam was administered in doses of 1 mg and 2 mg in conditions 1 and 2; flunitrazepam in a dose of 2 mg was administered as the active drug control in the third condition; and a placebo was given in the fourth condition. Nightly doses of loprazolam 1 mg and flunitrazepam 2 mg can slightly degrade driving performance the following day, but the degree of impairment seems insufficient to preclude the drugs' use by drivers. Nightly doses of loprazolam 2 mg can seriously degrade driving performance for up to 17 hours and this dose is not recommended for use by drivers. ESA

N86-26827 Groningen Rijksuniversiteit (Netherlands). Traffic Research Center.
THE EFFECTS OF THE ANTIDEPRESSANTS OXAPROTILINE, MIANSERIN, AMITRYPTILINE AND DOXEPIN UPON ACTUAL DRIVING PERFORMANCE
J. W. LOUWERENS, K. A. BROOKHUIS, and J. F. OHANLON Jun. 1984 77 p Sponsored in part by Netherlands' Ministerie van Onderwijs en Wetenschapsbeleid and Ciba-Geigy AG, Basle, Switzerland
(VK-83-05; ISBN-90-6807-006-1; B8561711; ISSN-0167-8590; ESA-86-96949) Avail: Issuing Activity

The effects of antidepressants and a placebo were compared using a driving test. Five treatments were administered to 20 healthy young male volunteers on separate days, spaced at least 5 days apart. These were: oxaprotiline, amitryptiline and doxepin 75 mg (25 mg tid); mianserin 30 mg (10 mg tid); and placebo. Doses of each drug and placebo were administered 10, 6, and 2 hours before tests. Oxaprotiline is generally without adverse acute effects upon driving performance, but may produce either impairment or improvement in particular individuals. Amitryptiline, mianserin and doxepin, in that order, have adverse acute effects on driving performance. Individuals suffering impairment as a consequence of antidepressants' acute effects can recognize the implications for driving safety and cease driving, while others cannot, and continue driving with progressively deteriorating performance until their safety is seriously compromised. ESA

N86-26828# Yale Univ., New Haven, Conn. Dept. of Psychology.
COMPONENTS OF VERBAL INTELLIGENCE Final Report, 1 Oct. 1982 - 30 Sep. 1985
R. J. STERNBERG 30 Dec. 1985 47 p
(Contract N00014-83-K-0013)
(AD-A163359) Avail: NTIS HC A03/MF A01 CSCL 05J

This project develops and tests a theory of the components of verbal intelligence. Alternative theoretical frameworks for understanding verbal intelligence are reviewed, and then a componential theory of verbal comprehension is proposed. The theory specifies the information-processing components, context cues, and mediating variables underlying acquisition of word meanings from context. A number of experiments testing and supporting the theory are described, including experiments involving both internal and external context. Instructional experiments are also described, and it is concluded that the theory is well supported by the data, and moreover, that it can serve as a useful basis for training people in how to learn meanings of words from context. The theory is extended to novel kinds of concepts as well, and it is shown that the learning of novel concepts involves an interaction between linguistic and conceptual unfamiliarity. In a series of

experiments on causal inference involving verbal versus symbolic-abstract materials, it is shown that although a core of logical operations is applied to both verbal and abstract materials, special processes are involved when people reason about meaningful verbal materials. GRA

N86-26829# Xerox Palo Alto Research Center, Calif.
ACQUIRING PROCEDURAL SKILLS FROM LESSON SEQUENCES Final Report, 1 Jan. 1982 - 15 Jun. 1985
K. A. VANLEHN 13 Aug. 1985 53 p
(Contract N00014-82-C-0067)
(AD-A164580; ISL-9) Avail: NTIS HC A04/MF A01 CSCL 05J

This report provides an informal overview of a theory that describes how people learn certain procedural skills, such as arithmetic and algebra, from multi-lesson curricula. The central hypothesis is that students and teachers obey conventions that cause the goal hierarchy of the acquired procedure to be a particular structural function of the sequential ordering of lessons. This learning theory is an extension of Repair Theory, which describes how people mix interpretation and a certain type of meta-level problem solving as they try to solve practice problems. The learning theory has been embedded in a program that generates detailed predictions about the products of published curricula. The predictions have been tested against data from several thousand mathematics students. GRA

N86-26830# Naval Postgraduate School, Monterey, Calif.
CHANGES IN NAVAL AVIATION BASIC INSTRUMENT FLIGHT TRAINING: AN ANALYSIS M.S. Thesis
J. Y. WALLACE, III Dec. 1985 108 p
(AD-A164738) Avail: NTIS HC A06/MF A01 CSCL 05I

This thesis evaluates a modification to the Navy's Basic Instrument flight instruction, the performance of two groups of student aviators was compared. The modifications consisted of a lecture concentrating on the fundamentals of attitude instrument flight. One group of 100 students received the new training while a control group of 100 students did not. Analysis of the flight grades of the two groups revealed no significant difference in their performance. Based on the results of this research it was concluded that the modified basic instrument training did not improve the performance of student naval aviators. However, the modified lecture and training did improve the student's understanding of basic instrument fundamentals. The study recommended that the modified lecture should be continued as part of the syllabus because the benefits from affording the student aviators with additional training exceed the small costs involved. ign, Flight skills acquisition. GRA

N86-26831# Vanderbilt Univ., Nashville, Tenn. Dept. of Psychology.
INTERACTION OF IMAGE CHARACTERISTICS OF STEREOSCOPIC FORMS DURING DEPTH PERCEPTION Final Report, 1 Oct. 1980 - 30 Jun. 1984
R. FOX Aug. 1985 35 p refs
(Contract N00014-81-C-0001)
(AD-A164895; N14-0001-85C-0001) Avail: NTIS HC A03/MF A01 CSCL 06P

The primary objective of this research program was to determine the degree of congruence between the apparent or perceived depth position of a stereoscopic form and the position predictable from the physical conditions of stimulation. This topic, which bears directly on the veridicality or validity of depth information presented in a stereoscopic or 3-d display, has been investigated previously under restricted laboratory conditions that yield results of limited generality. For that reason, the present inquiry was pursued under naturalistic conditions similar to those that would obtain during the routine operation of visual displays. To gain insights into potential interactions between depth position (X-axis) and stimulus configuration (X- and Y-axes), stereoscopic forms were created from dynamic random element stereograms continuously generated electronically. This approach precluded the occurrence of non-stereoscopic cues that can arise in conventional depth displays. GRA

N86-26832# School of Aerospace Medicine, Brooks AFB, Tex.
THE HEALTHY MOTIVATION TO FLY: NO PSYCHIATRIC DIAGNOSIS Final Report, 1 Jul. - 31 Aug. 1985
R. R. ADAMS and D. R. JONES Nov. 1985 15 p refs
(AD-A164944; USAFSAM-TR-85-77) Avail: NTIS HC A02/MF A01 CSCL 05J

Aircrew mission effectiveness may uniquely be influenced by subtle psychological factors, not ordinarily brought to the attention of psychiatrists. Pilots tend to be bright, articulate, and anxious to resume their aviation duties when grounded. However, these patients are usually well defended, and rarely psychologically attuned or introspective. Greater insight into what constitutes the normal, healthy motivation to fly will help those who make judgements regarding the return of grounded aviators to flying duty. A review of associated birth order, personality theory, industrial and business psychology, aerospace, and psychoanalytic literature is presented. Highlighted are the difficulties inherent in examining the motivation of a healthy, well-defended population. Our conclusion: an examiner's countertransferential feelings are the best available tool for measurement of healthy motivation. GRA

N86-26833# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
THE ROLE OF ELABORATIONS IN INSTRUCTIONAL TEXTS: LEARNING TO USE THE APPROPRIATE PROCEDURE AT THE APPROPRIATE TIME Technical Report, Jan. - Oct. 1985
D. H. CHARNEY 14 Feb. 1986 85 p
(Contract N00014-84-K-0063; NR PROJ. RR0-4206)
(AD-A165211; TR-86-2-ONR) Avail: NTIS HC A05/MF A01 CSCL 05I

This research investigates the kinds of information that should be included in instructional texts that teach skills (such as manuals or textbooks). It focuses on an important subcomponent of skill learning: choosing the right procedure at the right time. Learning to choose the right procedure is difficult in skills such as using a computer because the connection between real-world goals and the generic procedures described in a manual is often obscure. Furthermore, when several procedures have similar functions, it is difficult to tell which one is best for a particular situation. In order to facilitate the decision process, instructional tests may include advice about when to use particular procedures and may illustrate the advice with examples. The research reported here investigated the effect of various forms of advice on learners' strategies for choosing a procedure. Subjects read one of four versions of a manual for a computer game called Box-World. Three versions contained advice about when to use particular game procedures; the advice was either stated as a simple verbal rule or elaborated with one of two types of examples. The fourth version contained no advice. Subjects then performed three tasks: a recall task, a recognition task (i.e., discriminating between correct and incorrect applications of the advice), and a decision task (i.e., solving problems for which the advice was relevant). Author (GRA)

N86-26834# Groningen Rijksuniversiteit (Netherlands). Traffic Research Center.
FLURAZEPAM HCL'S RESIDUAL (HANGOVER) EFFECTS UPON ACTUAL DRIVING PERFORMANCE
J. F. OHANLON, E. R. VOLKERTS, G. DEVRIES, A. VANARKEL, M. WIETHOFF, and T. MEIJER Nov. 1984 58 p Revised
Sponsored in part by Netherlands' Ministerie van Onderwijs en Wetenschapsbeleid and F. Hoffmann-La Roche and Co., Ltd., Basle, Switzerland
(VK-83-02; B8462753; ISBN-90-353-0030-0; ISSN-0167-8590; ESA-86-96947) Avail: NTIS HC A04/MF A01

The effects on driver performance of taking a hypnotic drug (flurazepam HCL) were assessed on 40 female subjects aged between 25 and 40. An acute experiment wherein a larger group's performance was assessed following 2 nights of drug or placebo treatment; and a subchronic experiment wherein a smaller group's performance was assessed, before, during and after 8 consecutive nights of treatment with flurazepam 30 mg were conducted. Flurazepam doses of 15 mg and 30 mg were administered in different treatment conditions of the acute experiment. Secobarbital

200 mg was administered in another condition as the active drug control, and a placebo was administered in the final condition. Flurazepam 30 mg impairs driving performance for at least 17 hours following drug intake. Flurazepam's residual effect is dose-dependent. Serious impairment can occur. ESA

N86-26835# National Aerospace Lab., Amsterdam (Netherlands). Flight Div.
A MODEL AND EXPERIMENTAL ANALYSIS OF PILOT DECISION MAKING BEHAVIOR FOR VARIOUS AUTOMATIC APPROACH CONDITIONS
R. C. VANDEGRAAF and P. H. WEWERINKE 5 Apr. 1984 48 p
(Contract NIVR-1857; BMFT-0101-ZA/WF/WRD-174/4)
(NLR-TR-84037-U; ESA-86-96980) Avail: NTIS HC A03/MF A01

Four experienced airline pilots monitored stabilized automatic approaches in a flight simulator, to assess a failure detection model. The tasks comprised the detection of excessive longitudinal and lateral windshears, and of system failures on the glideslope and localizer indicators. Two failure probability conditions were included to investigate the effect of the subject's failure expectancy on the detection performance. Good agreement between the model predictions and the experimental results of two subjects is obtained. The failure detection times of the two other subjects are larger, especially for the windshear conditions, due to a more conservative detection strategy. Results indicate the usefulness of an analytical capability for investigating relative effects of aircraft design parameters, such as display integrity, configuration, and format on failure detection performance. ESA

N86-27881# Joint Publications Research Service, Arlington, Va.
PSYCHOEMOTIONAL PILOT STRESS PRIOR TO EJECTION AND ITS ROLE IN APPROPRIATE PERFORMANCE
A. P. KOZLOVSKIY and A. F. KOVALENKO *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 19-24 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 16-19 Avail: NTIS HC A08

It was demonstrated that with respect to the psychoemotional state real and simulated catapulting events were similar. The time-course variations in the latent period of the motor reaction were obtained. The time interval between the command Go and the catapulting event was found to increase significantly in relation to the latent period. This was correlated with the level of psychoemotional strain. Author

N86-27883# Joint Publications Research Service, Arlington, Va.
EFFECT OF RHYTHMIC PHOTIC INTERFERENCE ON WORKING ELECTROENCEPHALOGRAM AND EFFICIENCY OF HUMAN MOVEMENTS
Y. T. PETRENKO and L. A. YERMUKHAMETOVA *In its* USSR Report: Space Biology and Aerospace Medicine, No. 1, January - February 1986 (JPRS-USB-86-003) p 29-33 17 Apr. 1986 Transl. into ENGLISH from Kosmicheskaya Biologiya i Aviakosmicheskaya Meditsina (Moscow, USSR), v. 20, no. 1, Jan. Feb. 1986 p 22-25
Avail: NTIS HC A08

The effect of rhythmic light flashes on the space-time pattern of brain biopotentials during motor functions and biomechanical efficiency of man's actions was investigated. As the motor model, the ability to maintain equilibrium when standing on the toes of one foot was used. Electroencephalography (EEG) from 12 neocortical areas and oscillations of the body mass center (stabilography) were recorded in 20 men who performed the exercise under normal conditions and during light flashes of 12 Hz. The resultant EEG and stabilograms were exposed to correlations-spectral and coherent analysis with the aid of an EC-1035 computer. Light flashes induced a change in the EEG peaks and flicker fusion frequency, a significant increase of the density of biopotentials corresponding to the light stimulation frequency, and a redistribution of the number of high intercentral correlations between neocoretical motor centers. When the light flashes were presented, 75 to 85% of the test subjects showed a 0.19 to 0.26 increase in the biopotential coherence of the premotor, motor and sensomotor areas. They also exhibited a significant decrease in the body stability and an increase in the stabilographic amplitude and frequency. It is suggested that the decline of biomechanical efficiency is associated with the disorders of the space-time integration between neocortical centers involved in the motor control system that are responsible for the execution of motor acts. Author

N86-27920*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ANALYTICAL TECHNIQUES OF PILOT SCANNING BEHAVIOR AND THEIR APPLICATION
R. L. HARRIS, SR., B. J. GLOVER (PRC Kentron, Inc., Hampton, Va.), and A. A. SPADY, JR. Jul. 1986 46 p refs
(NASA-TP-2525; L-15995; NAS 1.60:2525) Avail: NTIS HC A03/MF A01 CSCL 05I

The state of the art of oculometric data analysis techniques and their applications in certain research areas such as pilot workload, information transfer provided by various display formats, crew role in automated systems, and pilot training are documented. These analytical techniques produce the following data: real-time viewing of the pilot's scanning behavior, average dwell times, dwell percentages, instrument transition paths, dwell histograms, and entropy rate measures. These types of data are discussed, and overviews of the experimental setup, data analysis techniques, and software are presented. A glossary of terms frequently used in pilot scanning behavior and a bibliography of reports on related research sponsored by NASA Langley Research Center are also presented. Author

N86-27921# School of Aerospace Medicine, Brooks AFB, Tex.
US AIR FORCE COMBAT PSYCHIATRY Final Report, Jan. 1979 - Jun. 1985
D. R. JONES Jan. 1986 44 p
(AD-A165011; USAFSAM-TR-85-83) Avail: NTIS HC A03/MF A01 CSCL 05J

The U.S. Air Force faces the distinct possibility that its bases may be vulnerable to enemy attack. Combat fatigue may thus affect nonfliers, whereas in past conflicts fliers have been the ones affected. This report reviews the literature on the effects of combat: first on fliers, then on nonfliers. The report suggests that flight surgeons use 2 main agents of therapy, rest and the force of their personality, to delay or prevent combat fatigue in fliers. The report also discusses the relevant signs and symptoms, both in fliers and in nonfliers, and ends with a presentation of the principles of Brevity, Immediacy, Centrality, Expectancy, Proximity, and Similicity in dealing with combat fatigue in nonfliers. GRA

N86-27922# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Psychology.
INITIAL SKILL LEARNING: AN ANALYSIS OF HOW ELABORATIONS FACILITATE THE THREE COMPONENTS Technical Report, Oct. 1984 - Feb. 1986
D. H. CHARNEY and L. M. REDER 14 Feb. 1986 57 p
(Contract N00014-84-K-0063)
(AD-A165137; TR-86-1-ONR) Avail: NTIS HC A04/MF A01 CSCL 05J

This paper is concerned with the issue of how verbal instructions influence skill learning. In particular, our goal is to outline the components of initial cognitive skill acquisition and analyze what features of elaborations in the instructional materials can facilitate each component. We identify three basic components of skill learning: learning novel concepts and the functionality of novel concepts and procedures; learning how to execute the procedures; and learning the conditions under which the procedures can and should be applied. Each of these components can be learned independently and each component can be a bottleneck to acquiring a skill. Situation examples are the most useful type of elaboration for skill learning because each example can contribute to learning in all three components. On the other hand, while

analogies can be constructed to illustrate each component, they are more likely to help people learn the functionality of a procedure than how to execute it or when to select it. However, since learners tend to rely on examples as models, it is very important to choose examples with great care and to provide enough examples to illustrate the range of application of a rule or procedure. Otherwise, learners may interpret a rule incorrectly or make spurious assumptions about the conditions under which it applies. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-38510
VALIDATION OF SOM-LA OCCUPANT RESPONSE
D. H. LAANANEN (Arizona State University, Tempe) IN: Crash dynamics of general aviation aircraft; Proceedings of the General Aviation Aircraft Meeting and Exposition, Wichita, KS, April 16-19, 1985 . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 1-12. refs
(Contract DOT-FA03-84-P-01649)
(SAE PAPER 850850)

Program SOM-LA (Seat/Occupant Model - Light Aircraft) has been developed for use in evaluating the crashworthiness of aircraft seats and restraint systems. It combines a three-dimensional dynamic model of the human body with a finite element model of the seat structure. The seat analysis has the capability to model large displacements, nonlinear material behavior, local buckling, and various internal releases for beam elements. Simulation results are compared with test data for several impact orientations and for two restraint system configurations, including the use of a lap belt alone. Author

A86-38512
REGIONAL TOLERANCE TO IMPACT ACCELERATION
A. I. KING (Wayne State University, Detroit, MI) IN: Crash dynamics of general aviation aircraft; Proceedings of the General Aviation Aircraft Meeting and Exposition, Wichita, KS, April 16-19, 1985 . Warrendale, PA, Society of Automotive Engineers, Inc., 1985, p. 29-37. refs
(SAE PAPER 850852)

Human tolerance data have been acquired gradually over the past 25 years and are available for several body regions. There is now sufficient information to design restraint systems which can prevent serious injuries to the user and which have low injury-causing potential. This paper reviews recent research on injury mechanisms and injury tolerance. Most of the research was aimed at solving problems in automotive safety systems. Specific tolerance data for the following body regions are presented: head, chest, spine and lower extremities. Author

A86-38988
COSMONAUT TRAINING [PROFESSIONAL'NAIA PODGOTOVKA KOSMONAVTOV]
V. N. KUBASOV, V. A. TARAN, and S. N. MAKSIMOV Moscow, Izdatel'stvo Mashinostroenie, 1985, 288 p. In Russian. refs

Basic data concerning the methods and facilities for the scientific and technical training of cosmonauts are examined. The development and performance of ergatic space systems and the functions of the operator-cosmonaut in the system are studied. The requirements for the scientific and technical training of cosmonauts are described, and the procedures for the training are evaluated. The work efficiency of the operator-cosmonaut and training facilities is analyzed. I.F.

N86-26318# Messerschmitt-Boelkow-Blohm G.m.b.H., Munich (West Germany).
COCKPIT AUTOMATION REQUIREMENTS DERIVED FROM MISSION FUNCTIONS DATA
B. FAULKNER, R. SEIFERT, and K. D. RICHTER *In* AGARD Guidance-Control-Navigation Automation for Night All-Weather Tactical Operations 7 p Oct. 1985 refs
Avail: NTIS HC A07/MF A01

Program activities directed towards the development of a system engineering concept for the design of the man-machine interface are summarized. The problem was approached from an operational and human task point of view. The first phase included the development of: (1) a mission task list for selected mission and weapon systems; (2) a method for rating the relative importance of each of the tasks related (a) to the frequency of occurrence, (b) to mission effectiveness, and (c) to flight safety; (3) criteria and/or categories for automation at the man-machine interface, against which the individual mission tasks could be rated; and (4) a method for rating the mission tasks in relation to the automation categories derived. Author

N86-26319# Ferranti Defence Systems Ltd., Edinburgh (Scotland).
AUTOMATION AND PILOT INTERACTIONS IN NIGHT OR ALL-WEATHER TACTICAL OPERATIONS
W. H. MCKINLAY *In* AGARD Guidance-Control-Navigation Automation for Night All-Weather Tactical Operations 10 p Oct. 1985
Avail: NTIS HC A07/MF A01

Some of the areas in which automation could be used to reduce pilot workload when operating at night or in low visibility are examined. It is shown that in navigation the pilot's task extends from the planning stage before take off to the point at which tactical decisions are taken in the air. The role of the mission planning system and the features of a system developed for this purpose are covered. The nature of the man-machine interface including its required features and the impact of the latter on the core avionic system including navigation and the MMI are addressed. Author

N86-26805# German Army Aviation School, Bueckeburg (West Germany).
OPERATIONAL EXPERIENCES WITH NIGHT VISION GOGGLES IN HELICOPTER LOW-LEVEL FLIGHT AT NIGHT
H. HAIDN *In* AGARD Visual Protection and Enhancement 8p Dec. 1985 refs
Avail: NTIS HC A11/MF A01

The operational marginal conditions are described with regard to the threat analysis in the Central European theater. This is supplemented by a presentation of the technological and physical aspects of the available visual sensors, such as helmet mounted night vision goggles, low light level television, and forward looking infrared and their employment as pilotage aids within the helicopter cockpit. Also, a description is given of the work capabilities and limitations inherent with the employment of electro-optical vision aids. This involves a comparison of the visual capabilities of the unaided eye during low level flight with Moon illumination at night, conditions during reduced light levels, and viewing the same scene with electro-optical sensors. The requirement for glare protection within the cockpit is discussed and different solutions are represented. An exceptional and difficult problem to solve is currently presented by positive position fixing under the given circumstances. Aids and procedures to improve navigation were devised and are now successfully in use. Finally, the results of interviews with helicopter pilots, who have long term experience with the use of helmet mounted night vision goggles are discussed. Author

N86-26807# Naval Air Development Center, Warminster, Pa.
VISUAL AND SPECTRORADIOMETRIC PERFORMANCE CRITERIA FOR NIGHT VISION GOGGLES (NVG) COMPATIBLE AIRCRAFT INTERIOR LIGHTING
W. A. BREITMAIER and F. REETZ, III *In* AGARD Visual Protection and Enhancement 11 p Dec. 1985 refs
Avail: NTIS HC A11/MF A01

A draft military specification for NVG-compatible aircraft interior lighting was developed. The specification is based on the utilization of a specific type of NVG, the AN/AVS-6 Aviators Night Vision Imaging System (ANVIS). The performance requirements and testing methodology established in the specification and the rationale for developing these requirements are described. The performance requirements are affected by three factors: luminance, chromaticity, and ANVIS compatibility. Luminance requirements do not change drastically from the requirements that presently exist for interior lighting. However, the chromaticity requirements of green for primary and secondary lighting, and yellow for both master caution and warning indicators are different from those that presently exist. The reason for this change is that any lighting with a significant amount of red energy cannot be used in a cockpit that is required to be ANVIS compatible. The implications for this new color design for cockpit lighting are discussed together with the rationale for the chromaticity coordinates and limits chosen. ANVIS compatibility is defined in terms of the spectral sensitivity of the ANVIS and the combination of spectral radiance of the cockpit lighting and the outside world night radiance. Quantitative testing methodology for determining ANVIS compatibility of cockpit lighting is also discussed. A thorough description of all analytic and laboratory studies performed in support of this specification development is presented. Author

N86-26813# Letterman Army Inst. of Research, San Francisco, Calif.
COMPUTER VISUAL SIMULATION OF CONTRAST SENSITIVITY DEFICITS INDUCED BY LASER AND CHEMICAL ANTIDOTE EXPOSURE
H. ZWICK, D. MONROE, and L. SHERMAN *In* AGARD Visual Protection and Enhancement 4 p Dec. 1985
Avail: NTIS HC A11/MF A01

Training in some complex combat related tasks may produce a degree of transient visual impairment which may simulate what could be expected in combat. A method is presented for simulating visual impairment produced by potential combat conditions. The use of a computer to both digitize and store as well as produce the simulated image has provided an ideal tool for research. The degree of realism provided by such simulation offers suggestions for development of more realistic training techniques Author

N86-26816# National Aerospace Medical Centre, Soesterberg (Netherlands).
DYNAMIC BEHAVIOUR OF SPHERICAL AND ASPHERICAL CONTACT LENSES EXPOSED TO +GZ-ACCELERATION FORCES
H. PUNT, A. C. H. VANDENHEUVEL, H. H. VANDENBIGGELAAR (Royal Netherlands Air Force, The Hague.), G. J. HOEKSTRA, and A. J. P. ROUWEN (Militair Hospitaal Dr. A. Mathijsen, Utrecht (Netherlands).) *In* AGARD Visual Protection and Enhancement 5 p Dec. 1985
Avail: NTIS HC A11/MF A01

A study was made of the behavior of two types of hard contact lenses fitted to a young myopic pilot and exposed to +Gz-acceleration forces. The degree of dislocation of the hard lenses was studied as was the pathological phenomena of the cornea under increasing +Gz-forces. The two types of the evaluated contact lenses are a conventional spherical polymethylmethacrylate (PMMA) lens and an aspherical gas-permeable lens. In a human centrifuge a test person was exposed to +Gz-forces increasing from +1 to +9 Gz. In the gondola a videotelecamara was focussed at the head of the test person during the total test session. It could be concluded that the aspherical gas-permeable contact lenses maintained an optimal concentration under all circumstances. The conventional hard contact lenses with a spherical base curve and a smaller diameter showed downward decentration under increasing +Gz-loads from +6 Gz to a peak value of 8.6 Gz. However, the dislocation never caused the contact lens to leave the cornea. The results are discussed in relation to practical consequences for pilot flying high performance aircraft. Author

N86-26825# British Aerospace Public Ltd. Co., Lancashire (England). Cockpit Specialist Group.
HUMAN FACTORS: THE CINDERELLA DISCIPLINE IN COCKPIT INTERFACE DESIGN
K. W. MARTIN and J. LAYCOCK (Royal Aircraft Establishment, Farnborough, England) *In* AGARD Visual Protection and Enhancement 10 p Dec. 1985
Avail: NTIS HC A11/MF A01

The present trend in military aircraft design towards compact cockpits, multifunction controls and displays, and integrated systems within more agile and smaller airframes, has resulted in a greater need for human factors involvement in the design of the man machine interface. The cockpit of the modern military aircraft is inevitably a compromise of conflicting design disciplines, and one in which human factors fails to achieve any long term influence because the discipline lacks the absolute argument necessary for survival in the industrial environment. If human factors are to establish the degree of influence the current levels of research justify, then a new approach is necessary. This approach must recognize the practical problems associated with the design and manufacture of the integrated weapons delivery system that future aircraft represent. One possible approach may be the generation of human factors design tools, for use by engineers, which incorporate human sensory emulations and provide outputs that can be integrated into the engineering discipline. Author

N86-26836*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
BASELINE EXPERIMENTS IN TELEOPERATOR CONTROL
W. W. HANKINS, III and R. W. MIXON Jul. 1986 65 p
(NASA-TP-2547; L-15963; NAS 1.60:2547) Avail: NTIS HC A04/MF A01 CSCL 05H

Studies have been conducted at the NASA Langley Research Center (LaRC) to establish baseline human teleoperator interface data and to assess the influence of some of the interface parameters on human performance in teleoperation. As baseline data, the results will be used to assess future interface improvements resulting from this research in basic teleoperator human factors. In addition, the data have been used to validate LaRC's basic teleoperator hardware setup and to compare initial teleoperator study results. Four subjects controlled a modified industrial manipulator to perform a simple task involving both high and low precision. Two different schemes for controlling the manipulator were studied along with both direct and indirect viewing of the task. Performance of the task was measured as the length of time required to complete the task along with the number of errors made in the process. Analyses of variance were computed to determine the significance of the influences of each of the independent variables. Comparisons were also made between the LaRC data and data taken earlier by Grumman Aerospace Corp. at their facilities. Author

N86-26837# Cummings Solar Corp., Wilmington, Mass.
DESIGN AND PRODUCTION OF DAMAGE-RESISTANT TRAY PACK CONTAINERS Final Report, 13 Apr. 1984 - 31 Jul. 1985
R. D. CUMMINGS Jul. 1985 242 p refs
(Contract DAAK60-84-C-0011; DA PROJ. 1L1-62724-AH-99) (AD-A164595; NATICK-TR-86/008) Avail: NTIS HC A11/MF A01 CSCL 06H

The tray pack is a food container that serves the functions of food storage vessel; food heating vessel; and food serving vessel. The lid is drawn from 90-pound per base box (0.010-inch-thick) steel. The bottom or can is drawn from 90-pound per base box (0.010-inch-thick) steel. Both top and bottom have a polymeric inner linear and an outer organic coating. The cause of tray pack damage were determined to be: prestressing caused by vacuum

packing and underfilling; hydrodynamic forces induced by relative fluid motion within the tray pack at the moment of impact during dropping; and denting of the thin tray body material. The inability of the tray pack shipping container to withstand stacking loads was determined to be caused by poor tolerances of the shipping containers and denting of separation pads by the tray lid sealing seam. Test results show that damage can be prevented by avoiding vacuum packing, making the tray packs from 98-pound material, using a tray pack design employing reinforcing beads, using pads that nest within the sealing seam of the tray pack, and packing the tray packs so that the lids of the bottom two face down and top two face up. Test results also show that unit loads of tray packs can be stacked four high by using a properly dimensioned telescoping shipping container, the nesting pads and the two-up, two-down packing technique. GRA

N86-26838# Anthropology Research Project, Yellow Springs, Ohio.
DEMOGRAPHIC AND ANTHROPOMETRIC ASSESSMENT OF US ARMY ANTHROPOMETRIC DATA BASE Interim Report, Sep. 1984 - Apr. 1985
B. BRADTMILLER, J. RATNAPARKHI, and TEBBETTS, ILSE Aug. 1985 83 p
(Contract DAAK60-84-C-0086; DA PROJ. 1L1-62723-AH-98)
(AD-A164637; NATICK-TR-86/004) Avail: NTIS HC A05/MF A01 CSCL 05B

It has been nearly 20 years since the last anthropometric survey of Army males was conducted and about eight years since the last survey of Army females. The purpose of this report is to assess the extent to which the Army's existing anthropometric data base is representative of the current Army active duty force, both demographically and anthropometrically. The demographic variables of age, sex, and race are compared for the Army's existing anthropometric data base, the current active duty force, and the projected force of the 1990s. The changes in these variables occurring in the Army population are also contrasted with those occurring in the U.S. population at large. The anthropometric variables of stature and weight are compared for the existing data base and current active duty officers. Other anthropometric variables that are affected by race and age are also examined. Differences in anthropometric variables between the existing data base and the current active duty force are discussed in the context of secular trends in anthropometric measures from the U.S. population at large and other military populations. The implications of using the Army's existing anthropometric data base in the design and sizing of clothing and personal equipment are examined in light of the present and projected demographic composition of the Army active duty force. GRA

N86-26839# Materials Research Labs., Ascot Vale (Australia).
A LIGHTWEIGHT IMPERMEABLE SUIT FOR CHEMICAL PROTECTION IN WARM CONDITIONS: A PRELIMINARY LOOK AT THE CONCEPT
R. I. TILLEY, J. M. STANDERWICK, G. J. LONG, and H. D. CRONE Aug. 1985 22 p refs
(AD-A164687; MRL-R-972) Avail: NTIS HC A02/MF A01 CSCL 15B

A lightweight overgarment made of spun-bonded polyethylene was compared with the UK No. 1 Mk 3 NBC suit in terms of the heat burden imposed on wearers. The physiological responses of volunteers exercising in warm conditions were measured for both clothing ensembles and were found to be similar. These results suggested that the concept of a lightweight impermeable NBC suit for wear in jungle conditions was worthy of close investigation. Results also confirmed previous observations that soldiers wearing NBC clothing in warm and humid conditions could do little more than adopt a defensive position if they were not to become heat stress casualties. GRA

N86-26840# Pattern Analysis and Recognition Corp., McLean, Va.
HUMAN FACTORS IN RULE-BASED SYSTEMS Final Report
P. E. LEHNER, D. ZIRK, R. B. HALL, and L. ADELMAN 14 Oct. 1985 30 p refs
(Contract N00014-83-C-0537)
(AD-A165309; AD-E301922; PAR-85-109) Avail: NTIS HC A03/MF A01 CSCL 05H

This report summarizes several experiments investigating the impact of mental models and cognitive consistency on user/expert system interaction. Results indicate that user/expert system combined problem solving performance significantly improves if the user has a good mental model of expert system processes. Furthermore, cognitive consistency between the user and system problem solving procedures only degrades performance in situations where users do not have a good mental model. Some practical implications of this research is discussed.
Author (GRA)

N86-26841# Army Test and Evaluation Command, Aberdeen Proving Ground, Md.
SOLDIER-COMPUTER INTERFACE Final Report
30 Nov. 1985 215 p
(AD-A165326; TOP-1-1-059) Avail: NTIS HC A10/MF A01 CSCL 05E

The material in this TOP is intended to be used for the Human Factors Engineering (HFE) Evaluation of the Soldier-Computer Interface (SCI) of systems tested by TECOM. It encompasses procedures for an HFE Analysis and walk-through, mission simulation, and interview guide. Included are criteria in the form of checklists. GRA

N86-26842# School of Aerospace Medicine, Brooks AFB, Tex.
METHODOLOGY FOR INTEGRATION TESTING OF AIRCREW CLOTHING AND EQUIPMENT Final Report, Aug. 1982 - Dec. 1984
P. H. R. GILL Dec. 1985 19 p refs
(AD-A165328; USAFSAM-TR-84-19) Avail: NTIS HC A02/MF A01 CSCL 06Q

This report recommends a comprehensive range of tests for the integration and viability of an aircrew personal protective ensemble (PPE) or an item of PPE for use in an aircraft. It is emphasized that these tests are additional to any type test schedules for individual items of PPE. A test described in this report should be completed satisfactorily before the item or assembly is submitted for flight test evaluation. GRA

N86-26843# Pattern Analysis and Recognition Corp., McLean, Va.
MENTAL MODELS AND PROBLEM SOLVING WITH A KNOWLEDGE-BASED EXPERT SYSTEM
R. B. HALL Oct. 1985 28 p
(Contract N00014-83-C-0537)
(AD-A165398; PAR-85-108) Avail: NTIS HC A03/MF A01 CSCL 09B

Previous research in the area of user/expert system interaction has shown that the quality of problem solving with a general expert system (ES) is associated with mental model, a user's conceptual understanding of the basic principle of an ES's problem solving process. The current paper describes an experiment with MYCIN, a medical knowledge-based expert system, that lends additional support to the link between problem solving quality and mental model. GRA

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-38138
PREBIOTIC MATTER IN INTERSTELLAR MOLECULES
R. D. BROWN (Monash University, Clayton, Australia) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 123-137. refs

The pathways by which aminoacids (AA) may have been constructed from various interstellar molecules are discussed, with attention focused on the detection of aminoacids in molecular clouds, and the gas-phase production of AA in these clouds. A search for the simplest AA, glycine, has thus far been unsuccessful. However, the possibility that chemically close relatives might be formed by gas-phase reactions in molecular clouds is considered. Again, consideration is restricted to glycine. Through crude calculations, it was discovered that a reasonable rate of glycinonitrile production is feasible and that fractional abundances could be as high as 10 to the -10th. Hence, glycinonitrile illustrates the possible pathway to proteins and primitive life. The question of interstellar molecular survival during the formation of planetary systems by the collapse of molecular clouds is addressed. It is suggested that heavy meteoritic falls would have brought this material to the earth's surface. It is also suggested that the chemical ancestry of life passes through interstellar AA nitriles rather than through the acids themselves. In addition, it seems feasible that this ancestry goes back to a parental molecular cloud, which may have, in effect, led to the evolution of life on other planets. K.K.

A86-38139* Nobeyema Solar Radio Observatory (Japan).
RECENT OBSERVATIONS OF ORGANIC MOLECULES IN NEARBY COLD, DARK INTERSTELLAR CLOUDS
H. SUZUKI, M. OHISHI, M. MORIMOTO, N. KAIFU (Nobeyama Radio Observatory, Nagano, Japan), P. FRIBERG (Massachusetts, University; Five College Radio Astronomy Observatory, Amherst) et al. IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 139-144. refs
(Contract NAGW-436; NSF AST-82-12252)

Recent investigations of the organic chemistry of relatively nearby cold, dark interstellar clouds are reported. Specifically, the presence of interstellar tricarbon monoxide (C3O) in Taurus Molecular Cloud 1 (TMC-1) is confirmed. The first detection in such regions of acetaldehyde (CH3CHO), the most complex oxygen-containing organic molecule yet found in dark clouds is reported, as well as the first astronomical detection of several molecular rotational transitions, including the J = 18-17 and 14-13 transitions of cyanodiacetylene (HC5N), the 1(01)-0(00) transition of acetaldehyde, and the J = 5-4 transition of C3O. A significant upper limit is set on the abundance of cyanocarbene (HCCN) as a result of the first reported interstellar search for this molecule. Author

A86-38140* Leiden Univ. (Netherlands).
INFRARED SPECTRAL IDENTIFICATION OF COMPLEX ORGANIC MOLECULES IN INTERSTELLAR GRAINS
J. M. GREENBERG and W. SCHUTTE (Leiden, Rijksuniversiteit, Netherlands) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 145-150. refs
(Contract NGR-33-018-148)

The chemical evolution of interstellar grains leads ultimately to a comparison consisting largely of complex organic molecules. Comparison of infrared absorption spectra of laboratory produced analogue materials with astronomical observations confirm the the presence of similar molecules in interstellar space. The abundance of this complex organic matter derived from the strength of the absorption bands is of the order of ten million solar masses and is almost certainly as large or larger than all conceivable planets. Author

A86-38141
UNIVERSAL PROTEIN ANCESTORS FROM HYDROGEN CYANIDE AND WATER
C. N. MATTHEWS (Illinois, University, Chicago) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 151-156. refs

The crude organic solids which are formed in planetary, interplanetary and interstellar environments are analyzed, and connections are made between the components of these solids and the beginnings of life. It is proposed that a low energy route leading directly to the synthesis of heteropolypeptides, hydrogen cyanide and water is at the root of this cosmochemistry. The Miller-Urey paradigm is explained and laboratory and extraterrestrial data attest to the universality of the HCN polymerization process. This process accounts for both the past synthesis of protein ancestors on earth and reactions presently proceeding in the solar system, i.e., on planetary bodies around other stars and in the dusty molecular clouds of spiral galaxies. It is concluded that the existence of this preferred pathway enhances the probability that life is widespread throughout the universe. K.K.

A86-38142
PANSPERMIA - A MODERN ASTROPHYSICAL AND BIOLOGICAL APPROACH
J. M. GREENBERG and P. WEBER (Leiden, Rijksuniversiteit, Netherlands) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 157-164. refs

For the first time a laboratory simulation of the effect of the interstellar environment has been used to provide quantitative estimates of bacterial spore survival in the space between the stars. In the diffuse regions between clouds ten percent survival is limited to at most hundreds of years although one in ten thousand may survive for several thousand years. Within common dense clouds the ten percent life expectancy is extended to tens of millions of years because of the severely reduced ultraviolet within these clouds as well as because of the accretion of ultraviolet absorbing mantles on the spores. The random motion of molecular clouds is shown to provide a possible vehicle for transport of spores from one solar system to another. The most hazardous times in such a journey are at the start and finish and, although the requirements for survival during these periods are quantified here, the possibility or probability of their being satisfied remains pure conjecture. Author

A86-38143
NO VALID EVIDENCE EXISTS FOR INTERSTELLAR PROTEINS, BACTERIA, ETC
R. E. DAVIES, A. M. DELLUVA, and R. H. KOCH (Pennsylvania, University, Philadelphia) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 165-169. refs

The claims for large biological molecules and for prokaryotic and eukaryotic organisms in the interstellar medium are summarized. These claims are compared with new UV laboratory spectra of numerous specimens. The results are incompatible with these claims. Author

A86-38144
ASTRONOMICAL SOURCES OF CIRCULARLY POLARIZED LIGHT AND THEIR ROLE IN DETERMINING MOLECULAR CHIRALITY ON EARTH
R. D. WOLSTENCROFT (Royal Observatory, Edinburgh, Scotland) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 171-175. refs

A86-38145
SYNTHESIS AND ANALYSIS IN CHEMICAL EVOLUTION
C. PONNAMPERUMA (Maryland, University, College Park) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 185-197. refs

In the first part, the synthesis of the fundamental complex molecules of life (aminoacids and their polymerization to proteins, lipids, sugars, purines and pyrimidines, and nucleic acids) from simple molecules (H2O, CH4, NH3, HCN, CO2, etc) under a variety of natural and laboratory conditions and sources of energy is examined. In the second part, the analysis of the data that confirm the early appearance of life on earth and the presence of complex organic compounds in a variety of environments (carbonaceous chondritic meteorites, the atmospheres of Jupiter and Titan, interstellar space, etc.) is examined. All these results confirm the universal effectiveness of chemical evolution. Author

A86-38148
THE UNIVERSAL DIAGRAMS AND LIFE IN THE UNIVERSE
M. KAFATOS (George Mason University, Fairfax, VA) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 245-249. refs

The simplest properties of all matter are compared in an effort to attain some insights about life that would apply elsewhere. Many classes of known objects in the universe are put on common plots, called universal diagrams. The quantities plotted are mass, size, luminous output, temperature, angular momentum and entropy change of the universe due to radiation by these objects. The mass-luminosity diagram is presented, and after being juxtaposed with information provided by the temperature-luminosity diagram, the mass-angular momentum diagram and the entropy change diagram, it is concluded that what is normally referred to as the universe, with R at about 10 to the 28th cm and M at about 10 to the 56th gr, is not in any other way different from the rest of the objects that it is supposed to contain. As far as animate life in the universe is concerned, intelligent creatures would have masses of a similar magnitude to humans. Moreover, their buildings and artifacts would also be similar in magnitude. The question of explosive objects is also addressed. K.K.

A86-38150
ON THE OCCURRENCE AND APPEARANCE OF GALACTIC LIFE FORMS - A THERMODYNAMIC APPROACH
G. BODIFEE and C. DE LOORE (Brussel, Vrije Universiteit, Brussels, Belgium) IN: The search for extraterrestrial life: Recent developments; Proceedings of the Symposium, Boston, MA, June 18-21, 1984 . Dordrecht, D. Reidel Publishing Co., 1985, p. 255-259.

A86-38624
IN THE BEGINNING . . . THERE WAS CLAY?
R. SPANGENBURG and D. MOSER Space World (ISSN 0038-6332), vol. W-5-269, May 1986, p. 21-23.

Current NASA Ames research in support of the Cairns-Smith clay-life theory is discussed. The demonstration of the conversion, storage, and transfer of energy in clay supports the picture of clay as a prebiotic template for living organic matter. Such a template would allow fast chemical transitions and support the functions of adaptive behavior, self-replication, growth and repair, and the process of natural selection. The presence of clays in addition to amino acids in an uncontaminated carbonaceous meteorite discovered in 1970 may also support the clay-life theory. R.R.

N86-26844*# National Aeronautics and Space Administration, Washington, D.C.
SECOND SYMPOSIUM ON CHEMICAL EVOLUTION AND THE ORIGIN OF LIFE
D. L. DEVINCENZI, ed. and P. A. DUFOUR, ed. (George Washington Univ., Washington, D.C.) May 1986 128 p refs Symposium held at Moffett Field, Calif., 23-26 Jul. 1985
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Recent findings by NASA Exobiology investigators are reported. Scientific papers are presented in the following areas: cosmic evolution of biogenic compounds, prebiotic evolution (planetary and molecular), early evolution of life (biological and geochemical), evolution of advanced life, solar system exploration, and the Search for Extraterrestrial Intelligence (SETI).

N86-26846*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CHARACTERIZATION OF BIOGENIC ELEMENTS IN INTERPLANETARY DUST PARTICLES
T. E. BUNCH *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 41 May 1986
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Those particles that were designated cometary are aggregates of amorphous materials including carbon, iron-magnesium silicates, sulfides, metal and trace amounts of unusual phases. Most aggregates are carbon-rich with major and minor element abundances similar to a fine grained matrix of carbonaceous chondrites. Several particles were analyzed by a laser microprobe. The negative ionic species identified to date include carbon clusters, protonated carbon clusters, CN-, HCN-, CNO-, PO2-, PO3-, S-, S2- asnd OH-. These species are similar to those observed in cometary spectra and they support the assumption that organic materials are present. The occurance of phosphate ions suggests the presence of apatite or whitlockite. Cometary particle characteristics may indicate that the component grains represent primitive unaltered dust whose overall properties are extremely similar to altered primitive dust in carbonaceous chondrites.
Author

N86-26847*# Massachusetts Univ., Amherst. Dept. of Physics and Astronomy.
BOUNDARY CONDITIONS FOR THE PALEOENVIRONMENT: CHEMICAL AND PHYSICAL PROCESSES IN DENSE INTERSTELLAR CLOUDS
W. M. IRVINE, F. P. SCHLOERB, and L. M. ZIURYS *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 42 May 1986
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The present research includes searches for important new interstellar constituents; observations relevant to differentiating between different models for the chemical processes that are important in the interstellar environment; and coordinated studies of the chemistry, physics, and dynamics of molecular clouds which are the sites or possible future sites of star formation. Recent research has included the detection and study of four new interstellar molecules; searches which have placed upper limits on the abundance of several other potential constituents of interstellar clouds; quantitative studies of comparative molecular abundances in different types of interstellar clouds; investigation of reaction pathways for astrochemistry from a comparison of theory and the observed abundance of related species such as isomers and isotopic variants; studies of possible tracers of energenic events related to star formation, including silicon and sulfur containing molecules; and mapping of physical, chemical, and dynamical properties over extended regions of nearby cold molecular clouds. Author

N86-26848*# Molecular Research Inst., Palo Alto, Calif.
INTERSTELLAR ISOMERS
D. DEFREES, D. MCLEAN (IBM Research Lab., San Jose, Calif.), and E. HERBST (Duke Univ., Durham, N. C.) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 43 May 1986
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Both observational and theoretical studies of molecular clouds are hindered by many difficulties. One way to partially circumvent the difficulties of characterizing the chemistry within these objects is to study the relative abundances of isomers which are synthesized from a common set of precursors. Unfortunately, only one such system has been confirmed, the HCN/HNC pair of isomers. While the basic outlines of its chemistry have been known for some years, there are still many aspects of the chemistry which are unclear. Another potential pair of isomers is HCO+/HOC+; HCO+ is an abundant instellar molecule and a tentative identification of HOC+ has been made in Sgr B2. This identification is being challenged, however, based on theoretical and laboratory evidence that HOC+ reacts with H2. Another potential pair of interstellar isomers is methyl cyanide (CH3CN, acetonitrile) and methyl isocyanide (CH3NC). The cyanide is well known, however the isocyanide has yet to be observed despite theoretical predictions that appreciable quantities should be present. Author

N86-26849*# Rensselaer Polytechnic Inst., Troy, N.Y.
PHOTOLYSIS PRODUCTS OF CO, NH3 AND H2O AND THEIR SIGNIFICANCE TO REACTIONS ON INTERSTELLAR GRAINS
J. P. FERRIS *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 44 May 1986
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With the increase in evidence that interstellar grains are the basic building blocks of comets and with the realization that comet collisions with the earth have probably occured at a much higher frequency than earlier assumed it may be presumed that interstellar dust chemistry played an important role in the early chemistry of the earth. As a part of the study of the photochemical processes taking place on interstellar grains the photolysis of mixtures of CO, NH3 and H2O was performed at 10 K, 77K and 298K. The reaction products were determined by GC/MS and HPLC analysis to be lactic acid, glycolic acid, hydroxyacetamide, urea, biuret, oxamic acid, oxamide, glyceric acid and glyceramide. Ethylene glycol and glycerol were also detected but is is not clear at present whether these are true photoproducts or contaminants. The mechanism of formation of these molecules are discussed as well as their possible significance to the origins of life. Author

N86-26850*# California Univ., Berkeley. Dept. of Astronomy.
OBSERVATIONAL EXOBIOLOGY
J. TARTER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 45 May 1986 Prepared in cooperation with Search for Extraterrestrial Intelligence Inst., Los Altos, Calif.
Avail: NTIS HC A07/MF A01 CSCL 06C

The Earth's atmosphere absorbs partially or completely many ultraviolet, infrared and submillimeter wavelengths. Atmospheric seeing distorts small images, imposing a limit on the achievable angular resolution at optical and infrared wavelengths that is much poorer than the intrinsic capability of telescope optics. The atomic and molecular species of the atmosphere confuse or prevent the spectral studies of similar compounds outside of the terrestrial environment. Telescopes placed in orbit above the atmosphere avoid these problems and enjoy a unique view of the universe. There are many complex questions pertaining to the origin and evolution of the biogenic elements and compounds and the existence of terrestrial types of planets elsewhere that can be only tackled from orbiting facilities. The detailed nature of the spacecraft, platforms and instrumentation most likely to be launched by the United States and Europe in the near future in an attempt to determine what observational programs would be tractable and which areas of interest to exobiology required hardware capabilities beyond those currently envisioned are considered. Author

N86-26852*# Cornell Univ., Ithaca, N.Y. Lab. for Planetary Studies.
THE ORGANIC AEROSOLS OF TITAN
B. N. KHARE, C. SAGAN, W. R. THOMPSON, E. T. ARAKAWA, F. SUITS, T. A. CALCOTT, M. W. WILLIAMS, S. SHRADER, H. OGINO, T. O. WILLINGHAM et al. *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 48 May 1986 Submitted for publication
Avail: NTIS HC A07/MF A01 CSCL 06C

A dark reddish organic solid, called tholin, is synthesized from simulated Titanian atmospheres by irradiation with high energy electrons in a plasma discharge. The visible reflection spectrum of this tholin is found to be similar to that of high altitude aerosols responsible for the albedo and reddish color of Titan. The real (n) and imaginary (k) parts of the complex refractive index of thin films of Titan prepared by continuous dc discharge through a 0.9 N2/0.1 CH4 gas mixture at 0.2 mb is determined from X-ray to microwave frequencies. Values of n (approx. 1.65) and k (approx. 0.004 to 0.08) in the visible are consistent with deductions made by groundbased and spaceborne observations of Titan. Many infrared absorption features are present in k(lambda), including the 4.6 micrometer nitrile band. Molecular analysis of the volatile components of this tholin was performed by sequential and nonsequential pyrolytic gas chromatography/mass spectrometry. More than one hundred organic compounds are released; tentative identifications include saturated and unsaturated aliphatic hydrocarbons, substituted polycylic aromatics, nitriles, amines, pyrroles, pyrazines, pyridines, pyrimidines, and the purine, adenine. In addition,acid hydrolysis produces a racemic mixture of biological and nonbiological amino acids. Many of these molecules are implicated in the origin of life on Earth, suggesting Titan as a contemporary laboratory environment for prebiological organic chemistry on a planetary scale. Author

N86-26853*# Harvard Univ., Cambridge, Mass.
THE D TO H RATIO ON TITAN AND THE PLANETS: IMPLICATIONS FOR ORIGIN AND EVOLUTION OF PLANETARY ATMOSPHERES
J. P. PINTO, J. I. LUNINE (California Inst. of Tech., Pasadena), S. J. KIM, and Y. L. YUNG *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 49 May 1986
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Measurements of deuterated methane show that Titan's atmosphere is enriched by at least several times in deuterium compared to the major planets. Potential causative factors for this enrichment are condensation to form tropospheric methane clouds, fractionation occuring over a hypothetical CH4-C2H2 ocean and between the ocean and the clathrate crust beneath, fractionation which occurred during the formation of Titan and fractionation occuring as a result of the evolution of Titan's atmosphere. The greater part of the observed fractionation is probably derived from the formation of Titan and the subsequent evolution of Titan atmosphere driven by photochemistry. The latter process is developed here for the first time. The D/H ratio in a planetary atmosphere is one readily available measure of the origin and evolution of the hydrogen bearing volatiles on the planet. Comparison between D/H ratio in the inner solar system and the outer solar system may pose important constraints on current theories. Author

N86-26856*# National Aeronautics and Space Administration, Washington, D.C.

A GAS CHROMATOGRAPH EXPERIMENT FOR A TITAN ENTRY PROBE

G. C. CARLE, D. R. KOJIRO, B. J. OHARA, J. R. VALENTIN, V. R. W. OBERBECK, and T. W. SCATTERGOOD (State Univ. of New York, Stony Brook) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 53 May 1986

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Development of a gas chromatographic technique for analysis of aerosols and volatile organics from a Titan probe is now in progress. Preliminary investigations of aerosol collectors have shown that an electrostatic device should be the most efficient for the particle sizes expected in Titan's atmosphere. Such a device particularly lends itself to development of a simple pyrolyzer which can be used to break down any collected organic conglomerate structures into volatile fragments. Those fragments can subsequently be analyzed by GC providing information about the original chemical structure of the aerosols. Studies show that as little as 1 to 5 micrograms of model aerosol can be successfully analyzed. High altitude atmospheric gas sampling will also be important on Titan due to the great depth of the atmosphere. Studies show that a GC analysis of model Titan atmospheres at pressures approximating this altitude can be made with a sensitivity of a few ten's of parts-per-billion for the trace gases of interest. Author

N86-26857*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MOLECULAR AND ELEMENTAL DUST ANALYZER (MEDA) FOR THE COMET RENDEZVOUS ASTEROID FLYBY MISSION

B. J. OHARA, G. C. CARLE, and B. C. CLARK (Martin Marietta Aerospace, Denver, Colo.) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 54 May 1986

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Comets are some to the most primitive bodies in the solar system and therefore should contain elemental, chemical, and isotopic records of the early history of the solar system. An opportunity to perform in situ analyses of a comet nucleus exists with the Comet Rendezvous Asteroid Flyby (CRAF) mission. An integrated gas chromatograph/X-ray fluorescence instrument (MEDA), being proposed for inclusion onboard the CRAF spacecraft, will measure the molecular and elemental constituents of collected dust grains and ices. The gas chromatograph, employing helium ionization detectors and three columns designed to separate light gases, polar gases, and hydrocarbons will measure the volatile compounds of the biogenic elements thermally released from collected dust grains. The sensitivity of the GC for compounds of interest is at the picogram level. X-ray fluorescence utilized cryogenically cooled Si(Li) solid state detectors of nominal 150 eV resolution at 5.9 keV. Based on laboratory work with carbonaceous meteorites, both the GC and XRF can perform meaningful analyses with a few micrograms of collected comet dust. Author

N86-26858*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

INVESTIGATION OF POROUS POLYMER GAS CHROMATOGRAPHIC PACKINGS FOR ATMOSPHERIC ANALYSIS OF EXTRATERRESTRIAL BODIES

G. E. POLLOCK *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 55 May 1986

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Measurement of the permanent gases in the atmospheres of mission targets is a major objective. A 16 meter long Porapak N column was used on the Venus probe and required a rather high carrier gas flow rate. The researchers have, therefore, surveyed commercial porous polymer types which had some ability to resolve nitrogen, oxygen, argon and carbon monoxide gases. Porapaks N and Q appeared superior to most. Batch to batch variation, however, was quite wide, so the researchers learned how to synthesize porous polymer and investigated some of the factors affecting the separations. A polymer was synthesized which was superior to all commercial products and allowed at least a 50% reduction in length and flow rate of carrier gas. Similar studies were made concerning the separation of hydrocarbons and new porous polymers have been synthesized which represent significant improvements in time of analysis, column, and carrier gas flow rate. Author

N86-26859*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MINIATURE METASTABLE IONIZATION DETECTORS FOR EXOBIOLOGY FLIGHT EXPERIMENTS

F. H. WOELLER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 56 May 1986

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The Metastable Ionization Detector (MID) is three orders of magnitude more sensitive than the thermal conductivity detectors used on previous flight instruments. The miniature MID provides scientists with a much smaller and highly sensitive detector for flight gas chromatographs. A miniature MID featuring an unconventional triaxial electrode configuration was developed and used routinely in the laboratory. Although much smaller and lighter than the commercial MID, its performance characteristics parallel those of the traditional design. The detector is compatible with the modulated voltage circuitry, also developed here, and thus can perform over an expanded response range of more than 7 orders magnitude. A micro volume version of a miniature MID, with an internal volume of less than 8 microliter, was recently designed is now being tested. The micro volume MID uses carrier gas flow rates of approx. 2cc/min thus eliminating the need for makeup gas when capillary columns are used. Author

N86-26860*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MULTIPLEX GAS CHROMATOGRAPHY: A NOVEL ANALYTICAL TECHNIQUE FOR FUTURE PLANETARY STUDIES

J. R. VALENTIN, G. C. CARLE, and J. B. PHILLIPS (University of Southern Illinois, Carbondale) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 57 May 1986

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Determination of molecular species comprised of the biogenic elements in the atmospheres of planets and moons of the solar system is one the foremost requirements of the exobiologist studying chemical evolution and the origin of life. Multiplex chromatography is a technique where many samples are pseudo-randomly introduced to the chromatograph without regard to elution of preceding components. The resulting data are then reduced using mathematical techniques such as cross correlation or Fourier Transforms. To demonstrate the utility of this technique for future solar system exploration, chemical modulators were developed. Several advantages were realized from this technique in combination with these modulators: improvement in detection limits of several orders of magnitude, improvement in the analysis of complex mixtures by selectively modulating some of the components present in the sample, increase in the number of analyses that can be conducted in a given period of time, and reduction in the amount of expendables needed to run an analysis. In order to apply this technique in a real application, methane in ambient air was monitored continuously over a period of one week. By using ambient air as its own carrier all expendables beyond power were eliminated. Author

N86-26861*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ION MOBILITY DRIFT SPECTROMETER (IMDS) AS A FLIGHT ANALYTICAL INSTRUMENT TECHNIQUE
D. R. KOJIRO and G. C. CARLE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 58 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

A detailed knowledge of the history and abundances of the biogenic elements and their compounds throughout the solar system can provide the exobiologists with a basis for understanding the conditions necessary for chemical evolution and the origin of life. The Ion Mobility Drift Spectrometer is an ion molecule reactor coupled with an ion drift spectrometer. Sample molecules are ionized to form product ions in the reactant region. An electric field moves the ions through a drift region against the flow of a drift gas where they are separated according to their size and structure producing an ion mobility spectrum. These spectra provide the IMDS with virtually universal sample identification capability. To conform to the rigid limits of weight, volume and consumables placed on flight instrumentation, several aspects of the IMDS must be studied and redesigned for flight use. In addition to miniaturization of the instrument, a reduction in the high flow rates used for the drift gas is an obvious necessary consideration. The effect of drastically reduced drift flow rates on IMDS spectra was investigated by lowering flow rates from 500ml/min to 50ml/min. Changes in peak shape, drift time and total spectra were studied at each flow rate. Author

N86-26863*# California Univ., San Diego, La Jolla. Dept. of Chemistry.
ENERGY YIELDS IN THE PREBIOTIC SYNTHESIS OF HYDROGEN CYANIDE AND FORMALDEHYDE
R. STRIBLING and S. L. MILLER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 61 May 1986
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Prebiotic experiments are usually reported in terms of carbon yields, i.e., the yield of product based on the total carbon in the system. These experiments usually involve a large input of energy and are designed to maximize the yields of product. However, large inputs of energy result in multiple activation of the reactants and products. A more realistic prebiotic experiment is to remove the products of the activation step so they are not exposed a second time to the energy source. This is equivalent to transporting the products synthesized in the primitive atmosphere to the ocean, and thereby protecting them from destruction by atmospheric energy sources. Experiments of this type, using lower inputs of energy, give energy yields (moles of products/joule) which can be used to estimate the relative importance of the different energy sources on the primitive earth. Simulated prebiotic atmospheres containing either CH4, CO or CO2 with N2, H2O and variable amounts of H2 were subjected to a high frequency Tesla coil. Samples of the aqueous phase were taken at various time intervals from 1 hr to 7 days, and the energy yields were obtained by extrapolation to zero time. The samples were analyzed for HCN with the cyanide electrode and for H2CO by chromotropic acid. The spark energy was estimated by calorimetry. The temperature rise in an insulated discharge flask was compared with the temperature rise from a resistance heater in the same flask. These results will be compared with calculated production rates of HCN and H2CO from lightning and a number of photochemical processes on the primitive Earth. Author

N86-26864*# Maryland Univ., College Park. Lab. of Chemical Evolution.
SYNTHESIS AND ANALYSIS IN STUDIES OF CHEMICAL EVOLUTION
C. PONNAMPERUMA, M. K. HOBISH, K. KOBAYASHI, L. L. HUA, and N. SENARATNE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 62 May 1986
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Studies of the various processes that may have given rise to life on the Earth have demonstrated the appropriateness of an approach that makes use of analysis and synthesis. Analysis of extraterrestrial samples in the form of meteorites has demonstrated the presence of several precursors of biomolecules, most notably a full suite of nucleic acid bases and nucleotides of biological significance. These species were determined after exhaustive extraction of the sample and subsequent analysis using HPLC, GC, MS, and GC-MS. Procedural blanks indicate that these molecules are likely not the result of contamination during the extraction and analysis process. Similar species were found as products of spark discharge experiments in atmospheres thought to mimic primitive Earth conditions. These results indicate that the basic chemistry underlying these syntheses is common, and that life may not be unique to the Earth. Studies underway in the laboratory make use of proton nuclear magnetic resonance spectroscopy as a probe to assess associations between selected amino acids and any of several nucleotides comprising their genetic code and genetic anticode sequences. These studies demonstrate a clear selectivity by the anticode sequences, thus confirming the hydrophobicity studies performed by Lacey et al. These studies further support the contention that life is likely a natural result of the physics and chemistry of the universe. Author

N86-26865*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ISOTOPIC CHARACTERISATION OF PREBIOTIC SYNTHESIS OF ORGANIC MATERIAL
J. F. KERRIDGE (California Univ., Los Angeles.) and S. CHANG *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 63 May 1986
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Many primitive meteorites contain an insoluble organic material, much like terrestrial kerogen, whose mode of origin is currently unknown. When subjected to stepwise decomposition, this material, unlike its terrestrial counterpart, reveals characteristic release patterns for the stable isotopes of carbon, hydrogen and nitrogen as a function of fractional release of each element. The purpose of this study is to try to match those release patterns using organic matter synthesised in the laboratory under controlled conditions. If successful, such a study would shed light on the origin of kerogen-like organic matter in the early solar system and, by extension, on prebiotic organic synthesis in general. The range of possible syntheses, starting materials and reaction conditions to be investigated is considerable. Samples analysed to date include: a heavy oil produced by Fischer-Tropsch-type catalysis of CO + H2; a solid residue generated by a plasma discharge in CO + H2 + N2; a solid deposited on the electrodes of a Miller-Urey synthesis operating on CH4 + H2O + N2; and a solid residue formed by polymerization of light hydrocarbons procured by a Miller-Urey discharge acting on CH4. Significant structure is observed in the release patterns for the carbon and hydrogen isotopes from the synthetic samples, though there is little evidence for isotopic fractionation during the analysis itself. Author

N86-26866*# Massachusetts Inst. of Tech., Cambridge.
ORIGIN OF LIFE AND IRON-RICH CLAYS
H. H. HARTMAN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life 64 May 1986
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The premise that life began with self-replicating iron-rich clays is explored. In association with these clays and UV light, polar organic molecules, such as oxalic acid, were synthesized. The

carbonaceous chondrites have both iron-rich clays and organic molecules. It is convenient to classify meteoritic organic matter into 3 categories: insoluble polymer, hydrocarbons and polar organics (soluble in water). Recent work on the delta D, delta N-15 and delta C-13 has made it clear that these three fractions have been made by three different mechanisms. A significant fraction of the insoluble polymer has a delta-D which suggests that it was made in an interstellar medium. The hydrocarbons seem to have been made on a parent body by a Fischer-Tropsch mechanism. The polar organics were probably synthesized in a mixture of carbonate (NH4)2CO3, Fe(++) ion and liquid water by radiolysis. In a set of experiments the radiolysis of (NH4)2CO3 in the presence and absence of Fe(++) ion has been examined. The synthesis of glycine in the presence of Fe(++) ion is 3-4 times that in the absence of ferrous ion. The effects of the addition of hydrocarbons to this mixture are explored. Iron-rich clays at low temperature and pressure are synthesized. So far the results are not sufficiently crystalline to look for replication. It should be noted that organic chelating agents such as oxalic acid do increase the crystallinity of the clays but not sufficiently. The hydrothermal synthesis of iron-rich clays is being examined. Author

N86-26867*# San Jose State Univ., Calif.
CLAY ENERGETICS IN CHEMICAL EVOLUTION
L. M. COYNE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 65 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Clays have been implicated in the origin of terrestrial life since the 1950's. Originally they were considered agents which aid in selecting, concentrating and promoting oligomerization of the organic monomeric substituents of cellular life forms. However, more recently, it has been suggested that minerals, with particular emphasis on clays, may have played a yet more fundamental role. It has been suggested that clays are prototypic life forms in themselves and that they served as a template which directed the self-assembly of cellular life. If the clay-life theory is to have other than conceptual credibility, clays must be shown by experiment to execute the operations of cellular life, not only individually, but also in a sufficiently concerted manner as to produce some semblance of the functional attributes of living cells. Current studies are focussed on the ability of clays to absorb, store and transfer energy under plausible prebiotic conditions and to use this energy to drive chemistry of prebiotic relevance. Conclusions of the work are applicable to the role of clays either as substrates for organic chemistry, or in fueling their own life-mimetic processes. Author

N86-26868*# Polytechnic Inst. of New York, Brooklyn.
FURTHER WORK ON SODIUM MONTMORILLONITE AS CATALYST FOR THE POLYMERIZATION OF ACTIVATED AMINO ACIDS
F. R. EIRICH and M. PAECHT-HOROWITZ (Hebrew Univ. of Jerusalem, Rehovot (Israel).) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 66 May 1986
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When the polycondensation of amino acid acylates was catalyzed with Na-montmorillonite, the polypeptides were consistently found to exhibit a distribution of discrete molecular weights, for as yet undiscovered reasons. One possible explanation was connected to the stepwise mode of monomer addition. New experiments have eliminated this possibility, so that there is the general assumption that this discreteness is the result of a preference of shorter oligomers to add to others of the same length, a feature that could be attributed to some structure of the platelet aggregates of the montmorillonite. The production of optical stereoisomers is anticipated when D,L-amino acids are polymerized on montmorillonite. Having used an optically active surface, the essence of the results lies not only in the occurrence of optically active oligomers and polymers, but also in the fact that the latter exhibit the same molecular weight characteristics as the D,L-polymers. Preparatory to work contemplated on a parallel synthesis of amino acid and nucleotide oligomers, studies were continued on the co-adsorption of amino acids, nucleotides, and amino acid-nucleotides on montmorillonite. Author

N86-26869*# San Francisco State Univ., Calif. Dept. of Chemistry.
ADSORPTION AND CONDENSATION OF AMINO ACIDS AND NUCLEOTIDES WITH SOLUBLE MINERAL SALTS
J. ORENBERG and N. LAHAV (Hebrew Univ. of Jerusalem, Rehovot (Israel).) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 67 May 1986
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The directed synthesis of biopolymers in an abiotic environment is presumably a cyclic sequence of steps which may be realized in a fluctuating environment such as a prebiotic pond undergoing wetting-drying cycles. Soluble mineral salts have been proposed as an essential component of this fluctuating environment. The following sequence may be considered as a most primitive mechanism of information transfer in a fluctuating environment: (1) adsorption of a biomolecule onto a soluable mineral salt surface to act as an adsorbed template; (2) specific adsorption of biomonomers onto the adsorbed template; (3) condensation of the adsorbed biomonomers; and (4) desorption of the elongated oligomer. In this investigation, the salts selected for study were CaSO4.2H2O(gypsum), SrSO4, and several other metal sulfates and chlorides. Adsorption of the monomeric species, gly, 5'AMP 5'GMP, and 5'CMP was investigated. The adsorbed template biopolymers used were Poly-A, Poly-G, Poly-C, and Poly-U. The results of studies involving these experimental participants, the first two steps of the proposed primitive information transfer mechanism, and condensation of amino acids to form oligomers in a fluctuating environment are to be reported. Author

N86-26870*# Harvard Univ., Cambridge, Mass.
PALEOSOLS AND THE CHEMICAL EVOLUTION OF THE ATMOSPHERE
H. D. HOLLAND, E. A. ZBINDEN, and J. P. PINTO *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evoltuion of Life p 68 May 1986
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The chemistry and mineralogy of soils reflects the chemistry of the atmosphere below which they develop. Today the presence of a cover of land plants can obscure the signature of a highly oxidizing atmosphere. Prior to the advent of higher land plants ca. 400 m.y. ago the obscuring effect of a biological interface should have been minor. It can be shown that under such conditions the behavior of ferrous iron during weathering depends on the relationship between the ratio of the net concentration of oxidants to the concentration of acids in rainwater, and on the ratio of the oxygen demand to the acid demand for complete weathering of the parent rock. An analysis of the behavior of iron in some 15 paleosols between 1.0 and 2.9 b.y. in age showed some time ago that iron was retained, or largely retained, in paleosols developed on rocks with a low ratio of oxidant demand to acid demand (R value) and was lost from paleosols with a high R value. The results indicate that between 1.1 and 2.9 b.y.b.p. the ratio of the net concentration of oxidants to CO2 in rainwater was less than ca. 1/600 of the present-day value. Work during the past year has sought to extend the data base for paleosols and to define more precisely the relationships between the composition of paleosols and the chemistry of the atmosphere below which they developed. Author

N86-26871*# Santa Clara Univ., Calif. Dept. of Chemistry.
COOPERATION OF CATALYSTS AND TEMPLATES
D. H. WHITE, A. KANAVARIOTI, C. W. NIBLEY, and J. W. MACKLIN (Washington Univ., Seattle.) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 69 May 1986
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In order to understand how self-reproducing molecules could have originated on the primitive Earth or extraterrestrial bodies, it

would be useful to find laboratory models of simple molecules which are able to carry out processes of catalysis and templating. Furthermore, it may be anticipated that systems in which several components are acting cooperatively to catalyze each other's synthesis will have different behavior with respect to natural selection than those of purely replicating systems. As the major focus of this work, laboratory models are devised to study the influence of short peptide catalysts on template reactions which produce oligonucleotides or additional peptides. Such catalysts could have been the earliest protoenzymes of selective advantage produced by replicating oligonucleotides. Since this is a complex problem, simpler systems are also studied which embody only one aspect at a time, such as peptide formation with and without a template, peptide catalysis of nontemplated peptide synthesis, and model reactions for replication of the type pioneered by Orgel. Author

N86-26872*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MOLECULAR MICROENVIRONMENTS: SOLVENT INTERACTIONS WITH NUCLEIC ACID BASES AND IONS

R. D. MACELROY ,and A. POHORILLE (California Univ., Berkeley.) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 70 May 1986

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The possibility of reconstructing plausible sequences of events in prebiotic molecular evolution is limited by the lack of fossil remains. However, with hindsight, one goal of molecular evolution was obvious: the development of molecular systems that became constituents of living systems. By understanding the interactions among molecules that are likely to have been present in the prebiotic environment, and that could have served as components in protobiotic molecular systems, plausible evolutionary sequences can be suggested. When stable aggregations of molecules form, a net decrease in free energy is observed in the system. Such changes occur when solvent molecules interact among themselves, as well as when they interact with organic species. A significant decrease in free energy, in systems of solvent and organic molecules, is due to entropy changes in the solvent. Entropy-driven interactioins played a major role in the organization of prebiotic systems, and understanding the energetics of them is essential to understanding molecular evolution. Author

N86-26873*# Alabama Univ., Birmingham. Dept. of Biochemistry.

INTRAMOLECULAR INTERACTIONS IN AMINOACYL NUCLEOTIDES: IMPLICATIONS REGARDING THE ORIGIN OF GENETIC CODING AND PROTEIN SYNTHESIS

J. C. LACEY, JR., D. W. MULLINS, JR., C. L. WATKINS, and L. M. HALL *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 71 May 1986

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Cellular organisms store information as sequences of nucleotides in double stranded DNA. This information is useless unless it can be converted into the active molecular species, protein. This is done in contemporary creatures first by transcription of one strand to give a complementary strand of mRNA. The sequence of nucleotides is then translated into a specific sequence of amino acids in a protein. Translation is made possible by a genetic coding system in which a sequence of three nucleotides codes for a specific amino acid. The origin and evolution of any chemical system can be understood through elucidation of the properties of the chemical entities which make up the system. There is an underlying logic to the coding system revealed by a correlation of the hydrophobicities of amino acids and their anticodonic nucleotides (i.e., the complement of the codon). Its importance lies in the fact that every amino acid going into protein synthesis must first be activated. This is universally accomplished with ATP. Past studies have concentrated on the chemistry of the adenylates, but more recently we have found, through the use of NMR, that we can observe intramolecular interactions even at low concentrations, between amino acid side chains and nucleotide base rings in these adenylates. The use of this type of compound thus affords a novel way of elucidating the manner in which amino acids and nucleotides interact with each other. In aqueous solution, when a hydrophobic amino acid is attached to the most hydrophobic nucleotide, AMP, a hydrophobic interaction takes place between the amino acid side chain and the adenine ring. The studies to be reported concern these hydrophobic interactions. Author

N86-26874*# Salk Institute for Biological Studies, San Diego, Calif.

MOLECULAR REPLICATION

L. E. ORGEL *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 72 May 1986

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The object of our research program is to understand how polynucleotide replication originated on the primitive Earth. This is a central issue in studies of the origins of life, since a process similar to modern DNA and RNA synthesis is likely to have formed the basis for the most primitive system of genetic information transfer. The major conclusion of studies so far is that a preformed polynucleotide template under many different experimental conditions will facilitate the synthesis of a new oligonucleotide with a sequence complementary to that of the template. It has been shown, for example, that poly(C) facilitates the synthesis of long oligo(G)s and that the short template CCGCC facilities the synthesis of its complement GGCGG. Very recently we have shown that template-directed synthesis is not limited to the standard oligonucleotide substrates. Nucleic acid-like molecules with a pyrophosphate group replacing the phosphate of the standard nucleic acid backbone are readily synthesized from deoxynucleotide 3'-5'-diphosphates on appropriate templates. Author

N86-26875*# Cornell Univ., Ithaca, N.Y. Dept. of Chemistry.

STEREOSELECTIVE AMINOACYLATION OF RNA

D. A. USHER, M. C. NEEDELS, and T. BRENNER *In* NASA, Washington Symposium on Chemical Evolution and the Origin and Evolution of Life p 73 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

Prebiotic chemistry is faced with a major problem: how could a controlled and selective reaction occur, when there is present in the same solution a large number of alternative possible coreactants? This problem is solved in the modern cell by the presence of enzymes, which are not only highly efficient and controllable catalysts, but which also can impose on their substrates a precise structural requirement. However, enzymes are the result of billions of years of evolution, and we cannot invoke them as prebiotic catalysts. One approach to solving this problem in the prebiotic context is to make use of template-directed reactions. These reactions increase the number of structural requirements that must be simultaneously present in a molecule for it to be able to react, and thereby increase the selectivity of the reaction. They also can give a large increase in the rate of a reaction, if the template constrains two potential coreactants to lie close together. A third benefit is that information that is present in the template molecule can be passed on to the product molecules. If the earliest organisms were based on proteins and nucleic acids, then the investigation of peptide synthesis on an oligonucleotide template is highly relevant to the study of the origin of life.

Author

N86-26876*# Salk Institute for Biological Studies, San Diego, Calif.

MODELS OF GLYCOLYSIS: GLYCERALDEHYDE AS A SOURCE OF ENERGY AND MONOMERS FOR PREBIOTIC CONDENSATION REACTIONS

A. L. WEBER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 74 May 1986

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All organisms require energy in a chemical form for maintenance and growth. In contemporary life this chemical energy is obtained by the synthesis of the phosphoanhydride bonds of ATP. Among the biological processes that yield ATP, fermentation is generally

considered primitive, because it operates under anaerobic conditions by substrate-level phosphorylation which does not require compartmentation by membranes. Fermentation by the glycolytic pathway, which is found in almost every living cell, is an especially attractive energy source for primitive life. Glycolysis not only produces useful chemical energy (ATP), but intermediates of this pathway are also involved in amino acid synthesis and photosynthetic carbon-fixation. It is believed that energy and substrates needed for the origin of life were provided by nonenzymatic chemical reactions that resemble the enzyme-mediated reactions of glycolysis. These nonenzymatic reactions would have provided a starting point for the evolutionary development of glycolysis. Author

N86-26877*# Roswell Park Memorial Inst., Buffalo, N. Y. Unit of Theoretical Biology.

A COMPARATIVE STUDY OF PREBIOTIC AND PRESENT DAY TRANSLATIONAL MODELS

R. REIN, G. RAGHUNATHAN, J. MCDONALD, M. SHIBATA, and S. SRINIVASAN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 75 May 1986

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It is generally recognized that the understanding of the molecular basis of primitive translation is a fundamental step in developing a theory of the origin of life. However, even in modern molecular biology, the mechanism for the decoding of messenger RNA triplet codons into an amino acid sequence of a protein on the ribosome is understood incompletely. Most of the proposed models for prebiotic translation lack, not only experimental support, but also a careful theoretical scrutiny of their compatibility with well understood stereochemical and energetic principles of nucleic acid structure, molecular recognition principles, and the chemistry of peptide bond formation. Present studies are concerned with comparative structural modelling and mechanistic simulation of the decoding apparatus ranging from those proposed for prebiotic conditions to the ones involved in modern biology. Any primitive decoding machinery based on nucleic acids and proteins, and most likely the modern day system, has to satisfy certain geometrical constraints. The charged amino acyl and the peptidyl termini of successive adaptors have to be adjacent in space in order to satisfy the stereochemical requirements for amide bond formation. Simultaneously, the same adaptors have to recognize successive codons on the messenger. This translational complex has to be realized by components that obey nucleic acid conformational principles, stabilities, and specificities. This generalized condition greatly restricts the number of acceptable adaptor structures. Author

N86-26878*# Miami Univ., Coral Gables, Fla. Inst. for Molecular and Cellular Evolution.

PROTOBIOLOGICAL INFORMATION, BIDIRECTIONAL RECOGNITION AND REVERSE TRANSLATION

S. W. FOX, T. NAKASHIMA, A. PRZYBYLSKI, and G. VAUGHAN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 76 May 1986

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Emergence of protobiological information has been suggested by experiments in which heated mixtures of alpha-amino acids order themselves into a self limited array of thermal proteins. The polymers display selective catalytic, hormonal, and other activities. Interactions of varied cationic thermal proteins with polynucleotides indicate selective recognition in both directions. Reverse translation is partly a missing link in the molecular evolution flowsheet. The self ordering of amino acids serves conceptually as a deterministic evolutionary precursor of the modern coding mechanism. The possibility for the evolution of information at an early nontemplated protein stage is supported by findings of electrical signals from proteinoid microspheres prepared with no DNA/RNA in their history. The deposition of thermal copolyamino acids on lipid membranes in the Mueller-Rudin apparatus has here been found to produce electrical behavior like that evoked by bacterial EIM polypeptide. A new procedure is to make a film of membrane on the electrode; the results provide maximal repeatability. The principle of nonrandom biomacromolecular specificity identified by these studies in molecular evolution have been extrapolated to principles of evolution of advanced organisms. Author

N86-26879*# Hawaii Univ., Honolulu. Exobiology Lab.

PHOTOCHEMICAL REACTIONS OF VARIOUS MODEL PROTOCELL SYSTEMS

C. E. FOLSOME *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 77 May 1986

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Models for the emergence of cellular life on the primitive Earth, and for physical environments of that era have been studied that embody these assumptions: (1) pregenetic cellular forms were phase-bounded systems primarily photosynthetic in nature, and (2) the early Earth environment was anoxic (lacking appreciable amounts of free hydrogen). It was found that organic structures can also be formed under anoxic conditions (N2, CO3=, H2O) by protracted longwavelength UV radiation. Apparently these structures form initially as organic layers upon $CaCO_3$ crystalloids. The question remains as to whether the UV photosynthetic ability of such phase bounded structures is a curiosity, or a general property of phase bounded systems which is of direct interest to the emergence of cellular life. The question of the requirement and sailient features of a phase boundary for UV photosynthetic abilities was addressed by searching for similar general physical properties which might be manifest in a variety of other simple protocell-like structures. Since it has been shown that laboratory protocell models can effect the UV photosynthesis of low molecular weight compounds, this reaction is being used as an assay to survey other types of structures for similar UV photosynthetic reactions. Various kinds of structures surveyed are: (1) proteinoids; (2) liposomes; (3) reconstituted cell membrane spheroids; (4) coacervates; and (5) model protocells formed under anoxic conditions. M.G.

N86-26880*# Houston Univ., Tex.

THE PRINCIPLE OF COOPERATION AND LIFE'S ORIGIN AND EVOLUTION

J. ORO, G. ARMANGUE, and A. MAR *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 78 May 1986

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In simple terms a living entity is a negentropic system that replicates, mutates and evoluves. A number of suggestions have been made, such as directed panspermia, atmospheric photosynthesis, genetic overtaking from inorganic processes, etc., as alternative models to the accepted Oparin-Haldane-Urey model of the origin of life on Earth. This has probably occurred because in spite of tremendous advances in the prebiotic synthesis of biochemical compounds, the fundamental problem of the appearance of the first life--a primordial replicating cell-ancestral to all other forms of extant life, has remained elusive. This is indeed a reflection on the different fundamental nature of the problem involved. Regardless of which were the fundamental processes which occurred on the primitive Earth, it has to end up with the fundamental characteristics of an ancestral protocell. The problem of the emergence of the first ancestral cell was one of synergistic macromolecular cooperation, as it has been discussed by authors recently (COSPAR XXV Plenary Meeting). An analogous situation must have occurred at the time of the appearance of the first eucaryotic organism. Procaryotic life appeared probably during the first 600 million years of Earth history when the Earth was sufficiently cool and continually bombarded (in the late accretion period) by comets and minor bodies of the solar system, when the sea had not yet acquired its present form. Author

N86-26881*# Massachusetts Inst. of Tech., Cambridge. Dept. of Biology.
BASE PAIRING AND BASE MIS-PAIRING IN NUCLEIC ACIDS
A. H. J. WANG and A. RICH *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 78 May 1986
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In recent years we have learned that DNA is conformationally active. It can exist in a number of different stable conformations including both right-handed and left-handed forms. Using single crystal X-ray diffraction analysis we are able to discover not only additional conformations of the nucleic acids but also different types of hydrogen bonded base-base interactions. Although Watson-Crick base pairings are the predominant type of interaction in double helical DNA, they are not the only types. Recently, we have been able to examine mismatching of guanine-thymine base pairs in left-handed Z-DNA at atomic resolution (1A). A minimum amount of distortion of the sugar phosphate backbone is found in the G x T pairing in which the bases are held together by two hydrogen bonds in the wobble pairing interaction. Because of the high resolution of the analysis we can visualize water molecules which fill in to accommodate the other hydrogen bonding positions in the bases which are not used in the base-base interactions. Studies on other DNA oligomers have revealed that other types of non-Watson-Crick hydrogen bonding interactions can occur. In the structure of a DNA octamer with the sequence d(GCGTACGC) complexed to an antibiotic triostin A, it was found that the two central AT base pairs are held together by Hoogsteen rather than Watson-Crick base pairs. Similarly, the G x C base pairs at the ends are also Hoogsteen rather than Watson-Crick pairing. Hoogsteen base pairs make a modified helix which is distinct from the Watson-Crick double helix. Author

N86-26882*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARBON EXCHANGE BETWEEN THE MANTLE AND THE CRUST AND ITS EFFECT UPON THE ATMOSPHERE: TODAY COMPARED TO ARCHEAN TIME
D. DESMARAIS *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 81 May 1986
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Paleobiologists now recognize that the Earth's biosphere has been profoundly affected by geologic processes. One very important process is the dissipation of heat which has been generated by radioactivity and/or stored within the earth. Heat flow is responsible for crustal movements and therefore it is the principal architect for constructing the environments (e.g. shallow marine, continental, etc.) wherein life developed and flourished. Heat flow has also influenced the movements of volatile elements (e.g. C, N, H, S, rare gases, etc.) both within the Earth's crust and between the crust and mantle. The inventory of these elements in the Earth's crust is important, not just because some of them constitute the building blocks of organic matter, but also because they influence the biosphere's climate. The purpose of this work is to evaluate how the decline of heat flow over the course of the Earth's history has influenced the carbon inventory in the Earth's crust. Such an evaluation must first consider whether the rate at which carbon is presently being exchanged between the mantle and crust is sufficient to play an important role in controlling the crustal inventory. Secondly, this exchange of carbon must be reevaluated in the context of the Precambrian Earth's environment. One very important consideration is that the upper mantle was perhaps 300 C hotter 3 b.y. ago than it is today. Author

N86-26883*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EARTH'S EARLY ATMOSPHERE AS SEEN FROM CARBON AND NITROGEN ISOTOPIC ANALYSIS OF ARCHEAN SEDIMENTS
E. K. GIBSON, JR., L. P. CARR, I. GILMOUR (Open Univ., Milton, England), and C. T. PILLINGER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 82 May 1986
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The origin and evolution of the Earth's early atmosphere has long been a topic of great interest but determination of actual compositions over geologic time is a difficult problem. However, recent systematic studies of stromatolite deposits (Precambrian Paleobiology Research Group) has extended our knowledge of Archean ecosystems. It has been shown that many stromatolite deposits have undergone negligible alteration since their time of formation. The discovery of primary fluid inclusions within unaltered 3.5 b.y. old Archiean sediments and the observation that the 3.3 b.y. old Barberton cherts have remained closed to argon loss and have not been subjected to thermal metamorphism suggests that an opportunity exists for the direct measurement of the volatile constituents present at their time of formation. Of primary interest to this study was the possibility that the stromatolites and other Archean sediments might retain a vestige of the atmosphere and thus afford an indication of the variations in carbon dioxide and nitrogen isotopic compositions with time. A suite of essentially unaltered Archean stromatolites and the cherts of different ages and geologic sites have been analyzed for their trapped carbon dioxide and nitrogen compositions by the stepped combustion extraction tech nique utilizing static mass spectrometers for the isotope measurements. Author

N86-26884*# California Univ., Los Angeles. Inst. of Geophysics and Planetary Physics.
USE OF LABORATORY SIMULATED PYROLYSIS IN TRACING THE HISTORY OF SEDIMENTARY ORGANIC MATTER
I. R. KAPLAN, E. TANNENBAUM, and B. E. HUIZINGA *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 82 May 1986
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Results from laboratory simulated pyrolyses experiments show that in addition to depth of burial, preservation of kerogen, and hence any morphologic structure in it, is also dependent on the mineral matrix with which it is associated. In the presence of clay minerals, and especially under dry conditions, extractable lipids released during kerogen decomposition are more rapidly destroyed than in the presence of calcite or chert matrices. The result is production of gas, polar bitumen and pyrobitumen and destruction of biomarkers. During such an early reorganization of the kerogen, the biomarker constituents can be destroyed, or unrecognizably altered. The above process of organic residues maturation appears to be inhibited in the presence of water and is significantly reduced where kerogen is hosted in limestones, dolomites or cherts. These minerals have been characteristically found to be the most reliable in yielding morphological fossils and small quantities of extractable bitumen in Archean and Proterozoic rocks. To understand the validity of chemical and morphological fossils, in the early geologic record, it will be necessary to understand the process of kerogen in sedimentary rocks. To test the role of various minerals on the preservation process, kerogen extracted from a variety of rocks has been heated together with montmorillonite, illite and calcite. The kinetics of the process has been monitored and the products quantitatively identified. M.G.

N86-26885*# Indiana Univ., Bloomington. Biogeochemical Labs.

ISOTOPIC, PETROLOGIC AND BIOGEOCHEMICAL INVESTIGATIONS OF BANDED IRON-FORMATIONS

J. M. HAYES, A. J. KAUFMAN, C. KLEIN (New Mexico Univ., Albuquerque), S. A. STUDLEY, M. E. BAUR (California Univ., Los Angeles), and M. R. WALTER (Bureau of Mineral Resources, Geology and Geophysics, Canberra, Australia) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 84 May 1986

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It is recognized that the first occurrence of banded iron-formations (BIFs) clearly predates biological oxygenation of the atmosphere-hydrosphere system and that their last occurrences extend beyond plausible dates of pervasive biological oxygenation. For this reason, and because enormous quantities of oxidizing power have been sequestered in them, it is widely thought that these massive, but enigmatic, sediments must encode information about the mechanism and timing of the rise of atmospheric O2. By coupling isotopic analyses of iron-formation carbonates with biogeochemical and petrologic investigations, we are studying (1) the mechanism of initial sedimentation of iron; (2) the role of iron in microbially mediated diagenetic processes in fresh iron-formation sediments; and (3) the logical integration of mechanisms of deposition with observed levels of banding. Thus far, it has been shown that (1) carbonates in BIFs of the Hamersley Group of Western Australia are isotopically inhomogenous; (2) the nature and pattern of isotopic ordering is not consistent with a metamorphic origin for the overall depletion of C-13 observed in the carbonates; (3) if biological, the origin of the C-13 depleted carbonate could be either respiratory or fermentative; (4) iron may have been precipitate d as Fe(3+), then reduced to Fe(2+) within the sediment; and (5) sedimentary biogeochemical systems may have been at least partially closed to mass transport of carbonate species. Author

N86-26886*# Michigan Univ., Ann Arbor.

THE LUNAR NODAL TIDE AND THE DISTANCE TO TNE MOON DURING THE PRECAMBRIAN ERA

J. C. G. WALKER and K. J. ZAHNLE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 85 May 1986

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The origin and early evolution of life on Earth occurred under physical and chemical conditions distinctly different from those of the present day. The broad goal of this research program is to characterize these conditions. One aspect involves the dynamics of the Earth-Moon system, the distance of the Moon from the Earth, and the length of the day. These have evolved during the course of Earth history as a result of the dissipation of tidal energy. As the moon has receded the amplitude of oceanic tides has decreased while the increasing length of the day should have influenced climate and the circulation of atmosphere and ocean. A 23.3 year periodicity preserved in a 2500 million year old banded iron-formation was interpreted as reflecting the climatic influence of the lunar nodal tide. The corresponding lunar distance would then have been approx. 52 Earth radii. The influence of the lunar nodal tide is also apparent in rocks with an age of 680 million years B.P. The derived value for lunar distance 2500 million years ago is the only datum on the dynamics of the Earth-Moon system during the Precambrian era of Earth history. The implied development of Precambrian tidal friction is in accord with more recent paleontological evidence as well as the long term stability of the lunar orbit. Author

N86-26887*# California Univ., Los Angeles. Dept. of Earth and Space Sciences.

RECENT PROGRESS IN PRECAMBRIAN PALEOBIOLOGY

J. W. SCHOPF *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 87 May 1986

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Ongoing studies at UCLA include the following: (1) investigations in Archean and Proterozoic sequences of various locations; (2) laboratory and field studies of modern microbial biocoenoses (analogues of Precambrian microbial communities) especially those at Laguna Mormona, Baja California, Mexico; (3) development of new laboratory techniques for the separation and concentration of minute cellularly preserved fossils for isotopic and organic geochemical analyses; and (4) assembly of a computerized database for assessment of the timing and nature of major events occurring during Precambrian biotic evolution, and of the potential applicability of ancient microbiotas to problems of global biostratigraphy and biogeography. Author

N86-26888*# Illinois Univ., Urbana.

HIGHER-ORDER STRUCTURE OF RRNA

R. R. GUTELL and C. R. WOESE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 88 May 1986

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A comparative search for phylogenetically covarying basepair replacements within potential helices has been the only reliable method to determine the correct secondary structure of the 3 rRNAs, 5S, 16S, and 23S. The analysis of 16S from a wide phylogenetic spectrum, that includes various branches of the eubacteria, archaebacteria, eucaryotes, in addition to the mitochondria and chloroplast, is beginning to reveal the constraints on the secondary structures of these rRNAs. Based on the success of this analysis, and the assumption that higher order structure will also be phylogenetically conserved, a comparative search was initiated for positions that show co-variation not involved in secondary structure helices. From a list of potential higher order interactions within 16S rRNA, two higher-order interactions are presented. The first of these interactions involves positions 570 and 866. Based on the extent of phylogenetic covariation between these positions while maintaining Watson-Crick pairing, this higher-order interaction is considered proven. The other interaction involves a minimum of six positions between the 1400 and 1500 regions of the 16S rRNA. Although these patterns of covariation are not as striking as the 570/866 interaction, the fact that they all exist in an anti-parallel fashion and that experimental methods previously implicated these two regions of the molecule in tRNA function suggests that these interactions be given serious consideration. Author

N86-26889*# Houston Univ., Tex. Dept. of Biochemical Sciences.

THE RRNA EVOLUTION AND PROCARYOTIC PHYLOGENY

G. E. FOX *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 89 May 1986

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Studies of ribosomal RNA primary structure allow reconstruction of phylogenetic trees for prokaryotic organisms. Such studies reveal major dichotomy among the bacteria that separates them into eubacteria and archaebacteria. Both groupings are further segmented into several major divisions. The results obtained from 5S rRNA sequences are essentially the same as those obtained with the 16S rRNA data. In the case of Gram negative bacteria the ribosomal RNA sequencing results can also be directly compared with hybridization studies and cytochrome c sequencing studies. There is again excellent agreement among the several methods. It seems likely then that the overall picture of microbial phylogeny that is emerging from the RNA sequence studies is a good approximation of the true history of these organisms. The RNA data allow examination of the evolutionary process in a semi-quantitative way. The secondary structures of these RNAs are largely established. As a result it is possible to recognize

examples of local structural evolution. Evolutionary pathways accounting for these events can be proposed and their probability can be assessed. Author

N86-26890*# California Univ., Berkeley. Space Sciences Lab.
INVESTIGATIONS WITH METHANOBACTERIA AND WITH EVOLUTION OF THE GENETIC CODE
T. H. JUKES *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 90 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Mycoplasma capricolum was found by Osawa et al. to use UGA as the code of tryptophan and to contain 75% A + T in its DNA. This change could have been from evolutionary pressure to replace C + G by A + T. Numerous studies have been reported of evolution of proteins as measured by amino acid replacements that are observed when homologus proteins, such as hemoglobins from various vertebrates, are compared. These replacements result from nucleotide substitutions in amino acid codons in the corresponding genes. Simultaneously, silent nucleotide substitutions take place that can be studied when sequences of the genes are compared. These silent evolutionary changes take place mostly in third positions of codons. Two types of nucleotide substitutions are recognized: pyrimidine-pyrimidine and purine-purine interchanges (transitions) and pyriidine-purine interchanges (transversions). Silent transitions are favored when a corresponding transversion would produce an amino acid replacement. Conversely, silent transversions are favored by probability when transitions and transversions will both be silent. Extensive examples of these situations have been found in protein genes, and it is evident that transversions in silent positions predominate in family boxes in most of the examples studied. In associated research a streptomycete from cow manure was found to produce an extracellular enzyme capable of lysing the pseudomurein-contining methanogen Methanobacterium formicicum. Author

N86-26891*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
IS THE ATPASE FROM HALOBACTERIUM SACCHAROVORUM AN EVOLUTIONARY RELIC?
L. I. HOCHSTEIN, W. ALTEKAR (Bhabha Research Center (India).), and H. KRISTJANSSON *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 91 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The ATP Synthase Complex present in the membranes of mitochondria, chloroplasts or bacteria is composed of 2 sectors: FO, an integral membrane protein consisting of 3 subunits mediating proton translocation across the membrane and F1, the catalytic component composed of 5 non-identical subunits. The apparent early origin of the ATP Synthase Complex, as implied by its ubiquitous distribution, seems inconsistent with its structural and functional complexity and raises the question if simpler versions of the ATP Synthase exist. Such an ATP Synthase has been searched for in various Archaebacteria. A purified halobacterial ATPase activity which possesses certain properties consistent with those of an ATP Synthase but which has a different subunit structure is described. M.G.

N86-26892*# California Univ., Irvine.
FUNCTIONAL AND EVOLUTIONARY RELATIONSHIPS BETWEEN BACTERIORHODOPSIN AND HALORHODOPSIN IN THE ARCHAEBACTERIUM, HALOBACTERIUM HALOBIUM
J. K. LANYI *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 92 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The archaebacteria occupy a unique place in phylogenetic trees constructed from analyses of sequences from key informational macromolecules, and their study continues to yield interesting ideas on the early evolution and divergence of biological forms. It is now known that the halobacteria among these species contain various retinal-proteins, resembling eukaryotic rhodopsins, but with different functions. Two of these pigments, located in the cytoplasmic membranes of the bacteria, are bacteriorhodopsin (a light-driven proton pump) and halorhodopsin (a light-driven chloride pump). Comparison of these systems is expected to reveal structure/function relationships in these simple (primitive?) energy transducing membrane components and evolutionary relationships which had produced the structural features which allow the divergent functions. Findings indicate that very different primary structures are needed for these proteins to accomplish their different functions. Indeed, analysis of partial amino acid sequences from halo-opsin shows already that few if any long segments exist which are homologous to bacterio-opsin. Either these proteins diverged a very long time ago to allow for the observed differences, or the evolutionary clock in the halobacteria runs faster than usual. M.G.

N86-26893*# California Univ., Berkeley. Div. of Molecular Plant Biology.
THIOREDOXINS IN EVOLUTIONARILY PRIMITIVE ORGANISMS
B. B. BUCHANAN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 93 May 1986
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Thioredoxins are low molecular weight redox proteins, alternating between the S-S (oxidized) and SH (reduced) states, that function in a number of biochemical processes, including DNA synthesis, DNA replication, and enzyme regulation. Until recently, reduced ferredoxin was known to serve as the source of reducing power for the reduction of thioredoxins only in oxygenic photosynthetic cells. In all other organisms, the source of hydrogen (electrons) for thioredoxin reduction was considered to be NADPH. It was found that Clostridium pasteurianum, an anaerobic organism normally living in the soil unexposed to light, resembles photosynthetic cells in using ferredoxin for the reduction of thioredoxin. The results reveal the existence of a pathway in which ferredoxin, provides the reducing power for the reduction of thioredoxin via the flavoprotein enzyme, ferredoxinthioredoxin reductase. In related studies, it was found that Chromatium vinosum, an anaerobic photosynthetic purple sulfur bacterium, resembles evolutionarily more advanced micro-organisms in having an NADP-thioredoxin system composed of a single thioredoxin which is reduced by NADPH via NADP-thioredoxin reductase. The adoption of the NADP-thioredoxin system by Chromatium seems appropriate in view of evidence tha the organi sm utilizes ATP-driven reverse electron transport. Finally, results of research directed towards the identification of target enzymes of the ferredoxin/thioredoxin system in a cyanobacterium (Nostoc muscorum), show that thioredoxin-linked photosynthetic enzymes of cyanobateria are similar to those of chloroplasts. It now seems that the ferredoxin/thioredoxin system functions in regulating CO2 assimilation via the reductive pentose phosphate cycle in oxygenic but not anoxygenic photosynthetic cells. M.G.

N86-26894*# Rockefeller Univ., New York.
BIOSYNTHETIC PORPHYRINS AND THE ORIGIN OF PHOTOSYNTHESIS
D. MAUZERALL, A. LEY, and J. A. MERCER-SMITH (Los Alamos National Lab., N. Mex.) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 94 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Since the prebiotic atmosphere was anaerobic, if not reducing, a useful function of primordial photosynthesis would have been to photooxidize reduced substrates such as Fe(+2), S(-2) or reduced organic molecules and to emit hydrogen. Experiments have shown that the early biogenic pigments uroporphyrin and coproporphyrin do photooxidize organic compounds and emit hydrogen in the presence of a platinum catalyst. These experiments were carried out in dilute aqueous solution near neutral pH under anaerobic atmosphere, and quantum yields near 10-2 were obtained. Thus relevant prebiotic conditions were maintained. Rather then to further

optimize conditions, attempts were made to replace the platinum catalyst by a more prebiotically suitable catalyst. Trials with an Fe4S4(SR)4 cluster, in analogy to the present hydrogenase and nitrogenase, were not successful. However, experiments using cobalt complexes to catalyze the formation of hydrogen are promising. In analogy with biological photosynthetic systems which group pigments, electron transfer molecules and enzymes in clusters for efficiency, it was found that binding the biogenic porphyrins to the polyvinyl alcohol used to support the platinum catalyst did increase the quantum yield of the reaction. It was also found that ultraviolet light can serve to photo-oxidize porphyrinogens to porphyrins under anaerobic conditions. Thus the formation of the colorless porphyriogens by the extraordinarily simple biosynthetic pathway would not be a problem because of the prevalence of UV light in the prebiotic, anoxic atmosphere. Author

N86-26895*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

OXYGEN AND THE EVOLUTION OF METABOLIC PATHWAYS

L. L. JAHNKE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 95 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

While a considerable amount of evidence has been accumulated about the history of oxygen on this planet, little is known about the relative amounts to which primitive cells might have been exposed. One clue may be found in the metabolic pathways of extant microorganisms. While eucaryotes are principally aerobic organisms, a number are capable of anaerobic growth by fermentation. One such eucaryotic microorganism, Saccharomyces cerevisiae, will grow in the complete absence of oxygen when supplemented with unsaturated fatty acid and sterol. Oxygen-requiring enzymes are involved in the synthesis of both of these compounds. Studies have demonstrated that the oxidative desaturation of palmitic acid and the conversion of squalene to sterols occur in the range of 10-(3) to 10(-2) PAL. Thus, if the oxygen requirements of these enzymatic processes are an indication, eucaryotes might be more primitive than anticipated from the microfossil record. Results of studies on the oxygen requirements for sterol and unsaturated fatty acid synthesis in a more primitive procaryotic system are also discussed. M.G.

N86-26896*# California Univ., San Diego, La Jolla.

EVOLUTION OF THIOL PROTECTIVE SYSTEMS IN PROKARYOTES

R. C. FAHEY and G. L. NEWTON *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 96 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

Biological thiols are essential elements in most aspects of cell function but undergo rapid oxidation to disulfides in the presence of oxygen. The evolution of systems to protect against such oxygen toxicity was essential to the emergence of aerobic life. The protection system used by eukaryotes is based upon glutathione (GSH) and GSH-dependent enzymes but many bacteria lack GSH and apparently use other mechanisms. The objective of this research is to elaborate the thiol protective mechanisms employed by prokaryotes of widely divergent evolutionary origin and to understand why GSH became the central thiol employed in essentially all higher organisms. Thiol-selective fluorescent labeling and HPLC analysis has been used to determine key monothiol components. M.G.

N86-26897*# Florida State Univ., Tallahassee. Dept. of Biological Science.

MICROFOSSILS IN THE ANTARCTIC COLD DESERT: POSSIBLE IMPLICATIONS FOR MARS

E. I. FRIEDMANN and R. OCAMPO-FRIEDMANN (Florida Agricultural and Mechanical Univ., Tallahassee) *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 97 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

In the Ross Desert of Antarctica, the principal life form is the cryptoendolithic microbial community in the near-surface layers of porous sandstone rocks. Biological, geological, and climatic factors interact in a complex and precarious balance, making life possible in an otherwise hostile environment. Once this balance is tipped, fossilization sets in. In the reverse case, new colonization of the rock surface may be initiated. As a result, fossilization is contemporary with modern life and both may be simultaneously present in a mosaic pattern. Also, different stages of fossilization are present. The process of fossilization takes place in a nonaquatic environment. If primitive life ever appeared on Mars, it is possible that with increasing aridity, life withdrew into an endolithic niche similar to that in the Antarctic desert. Fossilization in a nonaquatic environment may have set in with the result that traces of past life could be preserved. If such was the case, the study of the fossilization process in Antarctica may hold useful information for the analysis of Martian samples for microfossils. Author

N86-26898*# University of Southern Illinois, Carbondale.

EVOLUTIONARY SIGNIFICANCE OF OSMOREGULATORY MECHANISMS IN CYANOBACTERIA

J. H. YOPP, J. H. PAVLICEK, and M. H. SIBLEY *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 98 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

Physiological processes of all life forms on this planet are intrinsically related to their intracellular water potential. The overall goal was the elucidation of the mechanism(s) whereby the first oxygenic phtoautotrophs (the cyanobacteria) adjust their water potential to that of a changing external water potential (that is, osmoregulate). Osmoregulation is achieved by intracellular adjustment of inorganic and/or organic solutes (osmolytes) involving specific biochemical mechanisms. Structural and biochemical evolution within the cyanobacteria is believed completed (and fixed in present day forms) by the end of the Precambrain eon. Therefore, research using cyanobacteria of all three structural types (unicellular, filamentous, and branched), each grown in the photoautotrophic (PA), photoheterotrophic (PG), and chemotrophic (CH) modes of nutrition, should provide insight into the origin and evolution of the photosynthetically related osmoregulatory mechanisms of eukaryotic organisms. The chloroplasts of these organisms are phylogenetically related to the cyanobacteria. Author

N86-26899*# Boston Univ., Mass.

MICROBIAL CONTRIBUTIONS TO THE PRECAMBRIAN EARTH

L. MARGULIS, D. BERMUDES, and R. OBAR *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 99 May 1986

Avail: NTIS HC A07/MF A01 CSCL 06C

Life has existed on Earth for approximately 3.5 billion years. For most of this time, prokaryotic communities provided the major biological forces changing the Earth. Many changes in atmospheric gas composition occurred during the Archean and Proterozoic eons as a result of microbial activity. Extant microbial communities were used to help understand the dynamics which contributed to these atmospheric changes. The microbial mat communities were characterized according to the organismic constituents. Symbiosis in microbial communities is recognized as a major force in cell evolution. Among the evolutinary enigmas investigated is the problem of the origin of the undulipodia. Undulipodial microtubules are still deployed for major cellular processes such as mitosis and meiosis. Several prokaryotes were tested for the presence of

the S1-type protein, so far only spirochetes were found to possess it. The S1-type protein is being sought in cyanobacteria reported to contain microtubules. B.G.

N86-26900*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ORGANIC S13C VALUES VARY SLIGHTLY WITH SALINITY IN MICROBIAL MATS AT GUERRERO NEGRO, BAJA CALIFORNIA SUR, MEXICO: IMPLICATIONS FOR STROMATOLITE S13C VALUES
D. J. DESMARAIS, E. PETERSON, E. KWONG, and H. BUI *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 100 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Stromatolites, layered sedimentary rock structures produced by communities of microorganisms, constitute the most abundant early evidence of life on Earth. Microbial mats, which are found most frequently in hypersaline marine or hot spring environments, serve as useful modern analogs of stromatolitic communities. Biochemical studies of mats were conducted to assist in the interpretations of stromatolites. The data suggest that salinity effects are insufficient by themselves to cause the C-13 differences observed between Precambrian stromatolites and modern microbial mats. Author

N86-26901*# Chicago Univ., Ill.
THE FOSSIL RECORD OF EVOLUTION: ANALYSIS OF EXTINCTION
D. M. RAUP *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 102 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

There is increasing evidence that events in space have had direct effects on Earth history and on the history of life on Earth. Nowhere is this more evident than in mass extinction. The biosphere has undergone repeated devastation caused by relatively short-lived environmental stress, with species kill rates up to 80 and 95%. For five of the mass extinctions, geochemical or other evidence was reported suggesting large body impact as the cause of the environmental stress producing the extinctions. It was argued on statistical ground that the major extinction events are uniformly periodic in geological time. If it is true that large body impact is a principal cause of mass extinctions and if the periodicity is real, than a cosmic driving mechanism is inescapable. Paleontological data sets were developed which detail the ranges in geological time of about 4,000 families and 25,000 genera of fossil marine organisms. Analyses to date have concentrated on the most recent 250 million years. Associated with these studies are analyses of other aspects of Earth history which may have signatures indicative of extraterrestrial effects. Author

N86-26902*# Chicago Univ., Ill.
THE FOSSIL RECORD OF EVOLUTION: DATA ON DIVERSIFICATION AND EXTINCTION
J. J. SEPKOSKI, JR. *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 102 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Synoptic studies of the fossil record of complex life on Earth indicate increasingly that extinction, and especially mass extinction, were extremely important driving forces in the history of life. Analysis of a new compilation of geologic ranges for 25,000 genera of marine animals suggests that extinction events were much more frequent in occurrence and variable in magnitude than previously suspected. At least 30 well documented and potential mass extinctions were identified in the dataset. The most recent event, distributed over 260 to 0 ma. exhibit a stationary periodicity of 26.1 + or - 1 ma, implicating a cosmological forcing mechanism. Earlier events, especially in the 575 to 450 ma interval, are more frequent, possibly indicating either a breakdown of periodicity in the more distant past; and as yet undemonstrated diminution of the period length; or frequent aperiodic terrestrial perturbations of a less stable biota superimposed upon the cosmological periodicity. Author

N86-26903*# California Univ., Berkeley. Lawrence Berkeley Lab.
GEOCHEMICAL ANOMALIES, BOLIDE IMPACTS AND BIOLOGICAL EXTINCTIONS ON THE EARTH
F. ASARO, L. W. ALVAREZ, H. V. MICHEL, and W. ALVAREZ (California Univ., Berkeley.) *In* NASA, Washington Second Symposium in Chemical Evolution and the Origin and Evolution of Life p 104 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Geochemical and mineralogical techniques are used to search for evidence of extraterrestrial impacts associated with mass and lesser biological extinction peaks in the geological record. Studies of the Cretaceous-Tertiary boundary serve as a baseline for evaluating geochemical data from the extinction horizones. Other studies were generally concentrated on rock strata corresponding to the periodic extinction peaks noted by Raup and Sepkoski. A significant iridium anomaly in late Eocene marine sediments associated with extinctions of radiolaria in low latitudes and attributed to an extraterrestrial source is widely distributed in 8 to 9 sites around the world. Author

N86-26904*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CLIMATIC CONSEQUENCES OF VERY HIGH CO2 LEVELS IN EARTH'S EARLY ATMOSPHERE
J. F. KATSING *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 105 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Earth has approximately 60 bars of carbon dioxide tied up in carbonate rocks, or roughly 2/3 the amount of CO2 of the atmosphere of Venus. Two different lines of evidence, one based on thermodynamics and the other on geochemical cycles, indicate that a substantial fraction of thes CO2 may have resided in the atmosphere during the first few hundred million years of the Earth's history. A natural question which arises is whether this much CO2 would have resulted in a runaway greenhouse effect. One dimensional radiative/convective model calculations presented showed that the surface temperature of a hypothetical primitive atmosphere containing 20 bars of CO2 was less than 100 C; thus no runaway greenhouse effect would have occurred. The climatic stability of the early atmosphere is a consequence of three factors: reduced solar luminosity at that time, an increase in planetary albedo caused by Rayleigh scattering by CO2, and the stabilizing effects of a moist convection. The latter two factors are sufficient to prevent a CO2 induced runaway greenhouse effect on the present Earth as well, for CO2 levels up to 100 bars. Further studies are being undertaken to determine whether a runaway greenhouse effect could have occurred during the latter stages of the accretion process and, if so, whether it would have collapsed one the influx of material slowed down. Author

N86-26905*# Ohio State Univ., Columbus.
A DECADE OF SETI OBSERVATIONS
R. S. DIXON *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 107 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

A full time dedicated search for extraterrestrial radio signals of intelligent origin has been in progress at the Ohio State University Radio Observatory since 1973. The radio telescope has a collecting area of 2200 square meters, which is equivalent to a circular dish 175 feet in diameter. The search concentrates on a 500 kHz bandwidth centered on the 1420 MHz hydrogen line, Doppler corrected to the galactic standard of rest. A large portion of the sky visible from Ohio was searched, with particulat emphasis on the galactic center region and the M31 Andromeda galaxy. The survey is largely computer automated, and all data reduction is done in real time. Two distinct populations of signals were detected. The first is a relatively small number of signals which persist for over a minute and which are clearly extraterrestrial in origin. The second is the large number of signals which persist less than 10 seconds whose locations are anticorrelated with the galactic plane

but show clumps along the galactic axis. None of these signals were observed to recur, despite repeated observations. The cause of these signals were not determined. Author

N86-26906*# California Univ., Berkeley. Space Sciences Lab.
THE BERKELEY SERENDIP PROJECT
S. BOWYER, D. WERTHIMER, J. TARTER, and R. BUHSE *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 108 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

An automated system was designed to perform a real time search for narrow band radio signals in the spectra of sources in a regularly scheduled, non-SETI astronomical observing program. The system will compute the power spectrum using a 65,536 channel fast Fourier transform processor with a real time bandwidth of 128 KHz and 2 Hz per channel resolution. After search for peaks in a 100 KHz portion of the IF band of the radio telescope, the system will move to the next 100 KHz portion using a programmable frequency synthesizer. When the whole IF band is scanned, the process will start again. Unidentified peaks in the power spectra are candidates for further study and their celestial coordinates will be recorded along with the time and power, IF and RF frequency, and bandwidth of the peak. Most of the hardware was developed and the machine software is in the process of being finalized. A number of means for identifying and rejecting power spectra peaks which have a high likelihood of being nonuseful are being investigated. Author

N86-26907*# California Univ., Berkeley. Space Sciences Lab.
AN INFRARED SEARCH FOR EXTRATERRESTRIAL LASER SIGNALS
A. BETZ *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 109 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The focus of project SETI is on microwave frequencies, where receivers fundamentally have the best sensitivity for the detection of narrow band signals. Such receivers, when coupled to existing radio telescopes, form an optimum system for broad area searches over the sky. Detection of narrow band infrared signals is best done with a laser heterodyne reciever similar in function to a microwave spectral line receiver. A receiver was built for astrophysical observations at 30 THz (10 microns) and the spectrometer is being adapted for SETI work. The receiver uses a small CO2 laser as the local oscillator, a HgCdTe diode as the photomixer, and a multichannel intermediate frequency (IF) filterbank. An advanced multichannel IF processor is now being built to detect infrared line radiation in 1000 spectral channels each 1 MHz wide. When completed this processor will be used with a ground based telescope next year for a survey of several hundred selected stars for narrow band CO2 laser signals at 30 THz. Author

N86-26908*# Boston Univ., Mass. Dept. of Astronomy.
USING THE IRAS DATA TO SEARCH IN THE ASTEROID BELT FOR ANY POTENTIAL EVIDENCE OF GALACTIC COLONIZATION
M. D. PAPAGIANNIS *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 110 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The end product of the biological evolution seems to be the appearance of technological civilizations, which are characterized by superior technology that supercedes biological capabilities. The Search for Extraterrestrial Intelligence (SETI) has gained scientific recognition in recent years. The concept of galactic colonization is debated extensively, with opinions ranging from the impossible to the inevitable, but without a clear resolution. Answers can be obtained only with experimental tests and not with endless debates. A search for large space colonies in the asteroid belt, an ideal source of raw materials for a spaceborne civilization, is a test of the galactic colonization theory. The catalogue of solar system objects obtained form the Infrared Astronomy Satellite (IRAS) observations at 12, 25, 60, and 100 microns, is an ideal source for such a search. The catalog is expected to be ready at the end of 1985 and will contain more than 10,000 objects. B.G.

N86-26909*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
OVERVIEW OF THE NASA SETI PROGRAM
B. M. OLIVER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 111 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The NASA Search of Extraterrestrial Intelligence (SETI) program plan is to scan the microwave window from 1 to 10 GHz with existing radio telescopes and sophisticated signal processing equipment looking for narrow band features that might represent artificial signals. A microwave spectrometer was built and is being field tested. A pattern recognition computer to search for drifting continuous wave signals and pulse trains in the output spectra is being designed. Equipment to characterize the radio frequency interference environment was also built. The plan is to complete the hardware and software by FY-88. Then, with increased funding, this equipment will be replicated in Very Large Scale Integration form. Observations, both a complete sky survey and a search fo nearby solar type stars, will begin in about 1990. The hypothesis that very powerful signals exist or that signals are being beamed at us will be tested. To detect the kinds of signals radiated at distances of 100 light years will require a collecting area kilometers in diameter. Author

N86-26910*# Stanford Univ., Calif. Radioscience Lab.
STANFORD HARDWARE DEVELOPMENT PROGRAM
A. PETERSON, I. LINSCOTT, and J. BURR *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 112 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

Architectures for high performance, digital signal processing, particularly for high resolution, wide band spectrum analysis were developed. These developments are intended to provide instrumentation for NASA's Search for Extraterrestrial Intelligence (SETI) program. The real time signal processing is both formal and experimental. The efficient organization and optimal scheduling of signal processing algorithms were investigated. The work is complemented by efforts in processor architecture design and implementation. A high resolution, multichannel spectrometer that incorporates special purpose microcoded signal processors is being tested. A general purpose signal processor for the data from the multichannel spectrometer was designed to function as the processing element in a highly concurrent machine. The processor performance required for the spectrometer is in the range of 1000 to 10,000 million instructions per second (MIPS). Multiple node processor configurations, where each node performs at 100 MIPS, are sought. The nodes are microprogrammable and are interconnected through a network with high bandwidth for neighboring nodes, and medium bandwidth for nodes at larger distance. The implementation of both the current mutlichannel spectrometer and the signal processor as Very Large Scale Integration CMOS chip sets was commenced. Author

N86-26911*# California Univ., Berkeley. Dept. of Astronomy.
GOLDSTONE FIELD TEST ACTIVITIES: TARGET SEARCH
J. TARTER *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 113 May 1986 Prepared in cooperation with Search for Extraterrestrial Intelligence Inst., Los Altos, Calif.
Avail: NTIS HC A07/MF A01 CSCL 06C

In March of this year prototype SETI equipment was installed at DSS13, the 26 meter research and development antenna at NASA's Goldstone complex of satellite tracking dishes. The SETI equipment will remain at this site at least through the end of the summer so that the hardware and software developed for signal detection and recognition can be fully tested in a dynamic observatory environment. The field tests are expected to help understand which strategies for observing and which signal recognition algorithms perform best in the presence of strong

man-made interfering signals (RFI) and natural astronomical sources. Author

N86-26912*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
GOLDSTONE FIELD TEST ACTIVITIES: SKY SURVEY
S. GULKIS and E. T. OLSEN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin and Evolution of Life p 114 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The goals are to conduct a research and development program aimed at determining the most effective way to do SETI within the constraints of current technology and estimated budgets. The general search strategy adopted is that which is recommended by the SETI Science Working Group. The strategy for an all sky survey for SETI was further developed over the last year. Scan patterns, scan rates, and signal detection algorithms were developed. Spectral power measurement instrumentation was tested at the Venus Station of the Goldstone Deep Space Communication Complex. A specially designed radio frequency interference (RFI) measurement system was built and installed at the Venus Station. A data base management system for storage and retrieval of the RFI data was partially implemented on a VAX 750 computer at the Jet Propulsion Laboratory. Author

N86-26913# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
JPL'S ROLE IN THE SETI PROGRAM
M. J. KLEIN *In* NASA, Washington Second Symposium on Chemical Evolution and the Origin of Life p 115 May 1986
Avail: NTIS HC A07/MF A01 CSCL 06C

The goal of the JPL SETI Team is to develop the strategies and the instrumentation required to carry out an effective, yet affordable, SETI Microwave Observing Program. The primary responsibility for JPL is the development and implementation of the Sky Survey component of the bimodal search program recommended by the SETI Science Working Group (NASA Technical Paper 2244, 1983). JPL is also responsible for the design and implementation of microwave analog instrumentation (including antenna feed systems, low noise RF amplifiers, antenna monitor and control interfaces, etc.) to cover the microwave window for the Sky Survey and the Target Search observations. The primary site for the current SETI Field Test activity is the Venus Station of the Goldstone Deep Space Communication Complex. A SETI controller was constructed and installed so that pre-programmed and real time SETI monitor and control data can be sent to and from the station controller. This unit will be interfaced with the MCSA. A SETI Hardware Handbook was prepared to describe the various systems that will be used by the project at the Venus Station; the handbook is frequently being expanded and updated. The 65,000 channel FFT Spectrum analyzer in the RFI Surveillance System was modified to permit operation with variable resolutions (300 Hz to less than 1 Hz) and with real-time accumulation, which will enhance the capability of the system for testing Sky Survey search strategies and signal detection algorithms. Author

N86-27152*# National Aeronautics and Space Administration, Washington, D.C.
EXOBIOLOGY EXPERIMENT CONCEPTS FOR SPACE STATION
L. D. GRIFFITHS (Management and Technical Services Co., Washington, D.C.) and D. L. DEVINCENZI *In* NASA. Lyndon B. Johnson Space Center Space Station Planetology Experiments (SSPEX) 1 p May 1986
Avail: NTIS HC A05/MF A01 CSCL 03A

The exobiology discipline uses ground based and space flight resources to conduct a multidiscipline research effort dedicated to understanding fundamental questions about the origin, evolution, and distribution of life and life related molecules throughout the universe. Achievement of this understanding requires a methodical research strategy which traces the history of the biogenic elements from their origins in stellar formation processes through the chemical evolution of molecules essential for life to the origin and evolution of primitive and, ultimately, complex living species. Implementation of this strategy requires the collection and integration of data from solar system exploration spacecraft and ground based and orbiting observatories and laboratories. The Science Lab Module (SLM) of the Space Station orbiting complex may provide an ideal setting in which to perform certain classes of experiments which form the cornerstone of exobiology research. These experiments could demonstrate the pathways and processes by which biomolecules are synthesized under conditions that simulate the primitive Earth, planetary atmospheres, cometary ices, and interstellar dust grains. Exobiology experiments proposed for the Space Station generally fall into four classes: interactions among gases and grains (nucleation, accretion, gas-grain reactions), high energy chemistry for the production of biomolecules, physical and chemical processes occurring on an artificial comet, and tests of the theory of panspermia. Author

N86-27923# Southwest Research Inst., San Antonio, Tex. Dept. of Bioengineering.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES
W. R. ROGERS, J. H. LUCAS, G. T. MOORE, and J. L. ORR 1985 18 p Presented at the DOE Contractors Conference, Alexandria, Va., 5 Nov. 1985
(Contract DE-AC02-80RA-50219)
(DE86-003748; CONF-8511143-1) Avail: NTIS HC A02/MF A01

An overall description of this research program is presented. The objectives are to investigate the use of nonhuman primates to investigate possible behavioral effects associated with exposure to high-intensity, 60 Hz, electric fields. DOE

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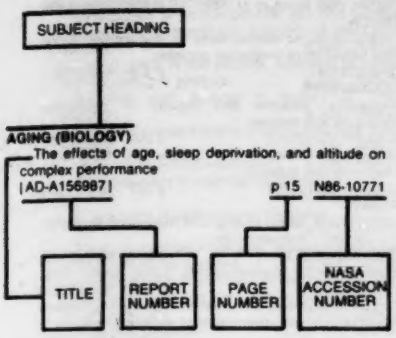

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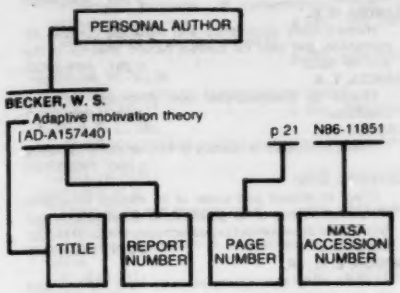

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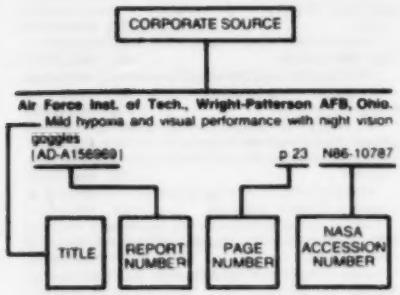

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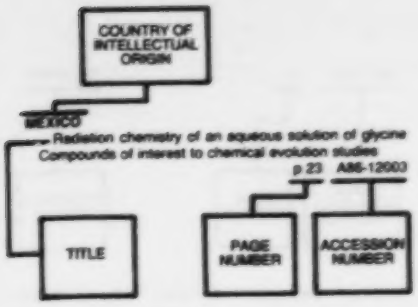

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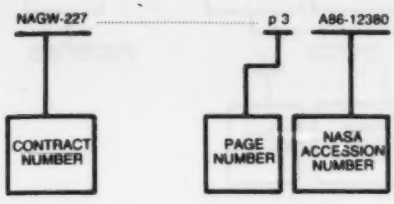

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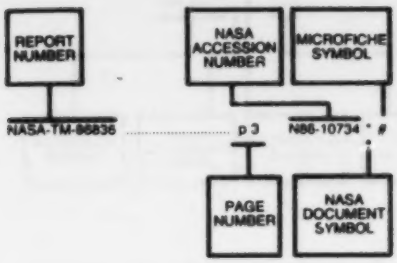

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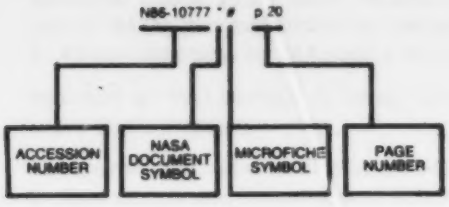

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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 290)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in October 1986 in

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 125 reports, articles and other documents announced during October 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR*, including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Category 54	**Man/System Technology and Life Support** Includes human engineering; biotechnology; and space suits and protective clothing.	383
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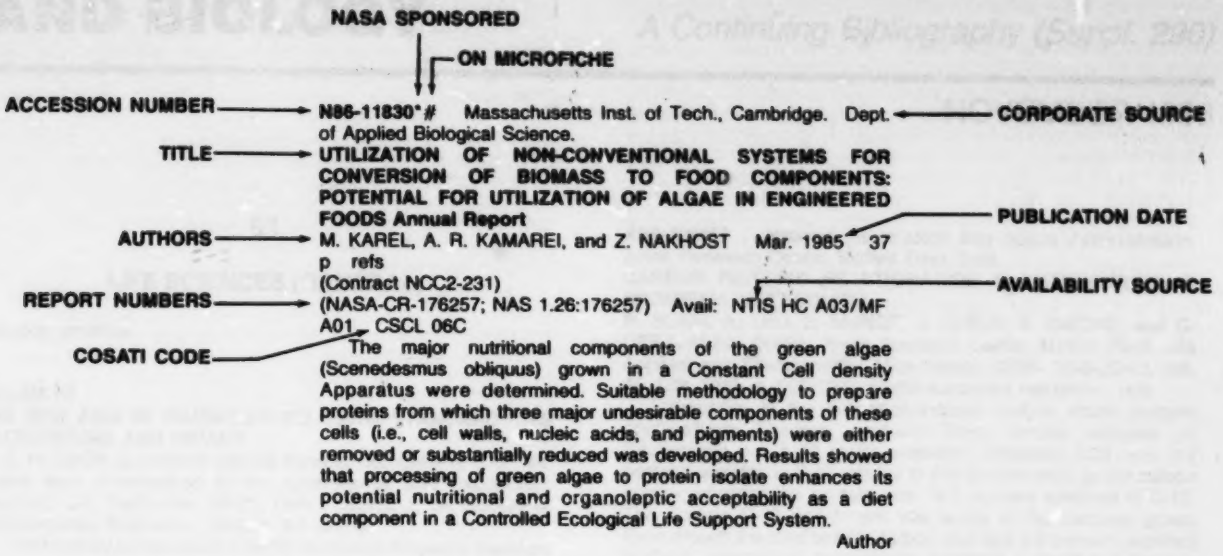
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PUBLICATION DATE
AUTHORS
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
(Contract NCC2-231)
AVAILABILITY SOURCE
REPORT NUMBERS
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
COSATI CODE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

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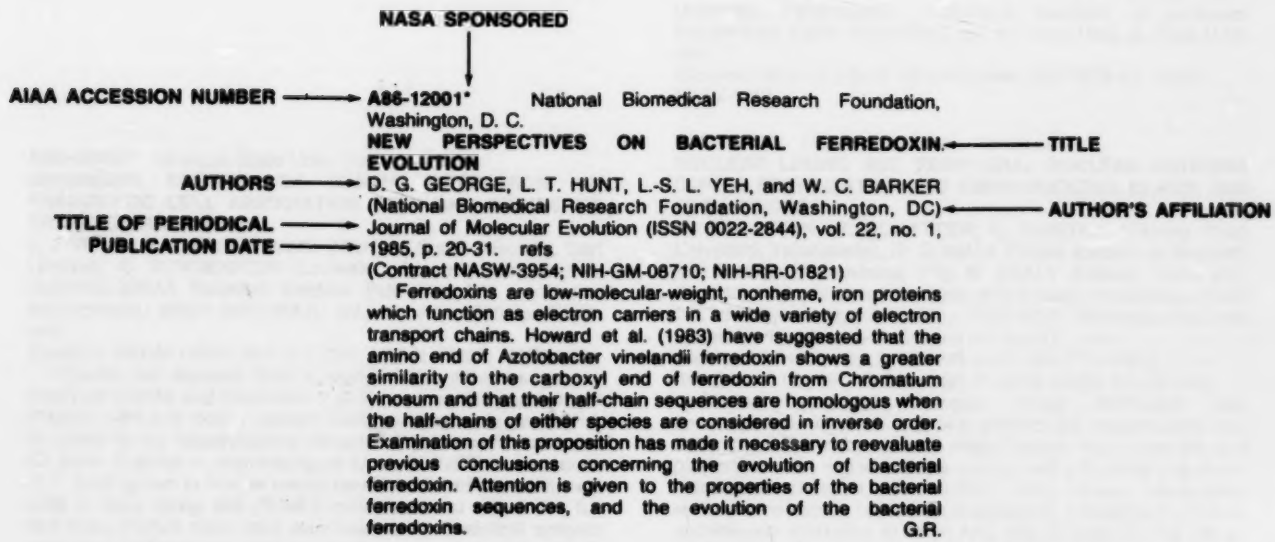
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AIAA ACCESSION NUMBER
A86-12001*
National Biomedical Research Foundation, Washington, D. C.
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
TITLE
AUTHORS
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER (National Biomedical Research Foundation, Washington, DC)
AUTHOR'S AFFILIATION
TITLE OF PERIODICAL
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1,
PUBLICATION DATE
1985, p. 20-31. refs
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 290)

NOVEMBER 1986

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-40519
THE NEW ANSI RF RADIATION EXPOSURE STANDARD - ITS BACKGROUND AND IMPACT
D. E. HUDSON (Lockheed Aircraft Service, Co., Ontario, CA) IN: Space tech; Proceedings of the Conference and Exposition, Anaheim, CA, September 23-25, 1985 . Dearborn, MI, Society of Manufacturing Engineers, 1985, p. 8-1 to 8-6.

The recently revised ANSI C95 RF Radiation Exposure Standard is presented with attention focused on instrumentation guidelines for measuring potentially hazardous fields. Some of the research background for the new standard is given and its impact explained. This revised standard, released in 1982, is concerned with the biological hazards of nonionizing RF radiation; it covers the radiant energy spectrum from 300 KHz to 100 Ghz. Radio frequency protection guides are indicated schematically in terms of mean squared electric and magnetic field strengths and the equivalent plane-wave free-space power density. It is noted that for mixed or broadband fields, at a number of frequencies for which there are different values of protection guides, the fraction of the protection guide within each frequency interval should not be greater than one. K.K.

A86-40666* Michigan State Univ., East Lansing.
ENHANCING EFFECTS OF GAMMA INTERFERON ON PHAGOCYTIC CELL ASSOCIATION WITH AND KILLING OF TRYPANOSOMA CRUZI
J. J. WIRTH, F. KIERSZENBAUM (Michigan State University, East Lansing), G. SONNENFELD (Louisville, University, KY), and A. ZLOTNIK (DNAX Research Institute, Palo Alto, CA) Infection and Immunity (ISSN 0019-9567), vol. 49, July 1985, p. 61-66. refs
(Contract NIH-AI-14848; NIH-AI-17041; NIH-AI-07203; NCC2-213)

Results are reported from a study of the influence gamma interferon (GIFN) and interleukin 2 (IL2) have on the capability of P388D1 cells and mouse resident peritoneal macrophages (MPM) to attach to the blood-resident parasites Trypanosoma cruzi and kill them. Cultures of trypomastigote forms of the Tulahuen strain of T. cruzi grown in bovine serum were introduced into peritoneal cells of mice, along with P388D1 cells incubated with GIFN, IL2 and both. Control cells were also maintained. Statistical analysis were then performed on data on counts of the number of dead T. Cruzi cells. The GIFN enhanced the interaction of MPM and P388D1 cells with the surface of T. Cruzi, provided the interaction was given over 12 hr to take place. A depression of the cytotoxicity of P388D1 cells was attributed to mediation by H2O2, an effect partially offset by incubation with the lymphokine GIFN. M.S.K.

A86-40669* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CARBON ISOTOPIC FRACTIONATION IN HETEROTROPHIC MICROBIAL METABOLISM
N. BLAIR, A. LEU, E. MUNOZ, J. OLSEN, E. KWONG, and D. DES MARAIS (NASA, Ames Research Center, Moffett Field, CA) Applied and Environmental Microbiology (ISSN 0099-2240), vol. 50, Oct. 1985, p. 996-1001. NASA-supported research. refs

Differences in the natural-abundance carbon stable isotopic compositions between products from aerobic cultures of Escherichia coli K-12 were measured. Respired CO2 was 3.4 percent depleted in C-13 relative to the glucose used as the carbon source, whereas the acetate was 12.3 percent enriched in C-13. The acetate C-13 enrichment was solely in the carboxyl group. Even though the total cellular carbon was only 0.6 percent depleted in C-13, intracellular components exhibited a significant isotopic heterogeneity. The protein and lipid fractions were -1.1 and -2.7 percent, respectively. Aspartic and glutamic acids were -1.6 and +2.7 percent, respectively, yet citrate was isotopically identical to the glucose. Probable sites of carbon isotopic fractionation include the enzyme, phosphotransacetylase, and the Krebs cycle.
Author

A86-40674* Florida State Univ., Tallahassee.
MICROTUBULE CONFIGURATIONS DURING FERTILIZATION, MITOSIS, AND EARLY DEVELOPMENT IN THE MOUSE AND THE REQUIREMENT FOR EGG MICROTUBULE-MEDIATED MOTILITY DURING MAMMALIAN FERTILIZATION
G. SCHATTEN, C. SIMERLY, and H. SCHATTEN (Florida State University, Tallahassee) National Academy of Sciences, Proceedings (ISSN 0027-8424), vol. 82, June 1985, p. 4152-4156. refs
(Contract NIH-HD-12913; NIH-RR-1466; NSF PCM-83-15900; NAG2-340)

A86-40675* Florida State Univ., Tallahassee.
NUCLEAR LAMINS AND PERIPHERAL NUCLEAR ANTIGENS DURING FERTILIZATION AND EMBRYOGENESIS IN MICE AND SEA URCHINS
G. SCHATTEN, H. SCHATTEN, C. SIMERLY (Florida State University, Tallahassee), G. G. MAUL (Wistar Institute of Anatomy and Biology, Philadelphia, PA), N. CHALY (Ottawa, University, Canada) et al. National Academy of Sciences, Proceedings (ISSN 0027-8424), vol. 82, July 1985, p. 4727-4731. Research supported by the Medical Research Council of Canada. refs
(Contract NIH-HD-12913; NIH-RR-1466; NIH-GM-21615; NIH-CA-10815; NIH-HD-363; NSF PCM-83-15900; NAG2-340)

Nuclear structural changes during fertilization and embryogenesis in mice and sea urchins are traced using four antibodies. The oocytes from virgin female mice, morulae and blastocytes from mated females, and gametes from the sea urchin Lytechnius variegatis are studied using mouse monoclonal antibodies to nuclear lamin A/C, monoclonal antibody to P1, human autoimmune antibodies to lamin A/C, and to lamin B. The mouse fertilization data reveal no lamins on the oocyte; however, lamins are present on the pronuclei, and chromosomes are found on the oocytes and pronuclei. It is detected that on the sea urchin sperm the lamins are reduced to acrosomal and centriolar fossae and peripheral antigens are around the sperm nucleus. The mouse sperm bind lamin antibodies regionally and do not contain antigens.

Lamins and antigens are observed on both pronuclei and chromosomes during sea urchin fertilization. Mouse embryogenesis reveals that lamin A/C is not recognized at morula and blastocyst stages; however, lamin B stains are retained. In sea urchin embryogenesis lamin recognition is lost at the blastrula, gastrula, and plutei stages. It is noted that nuclear lamins lost during spermatogenesis are restored at fertilization and peripheral antigens are associated with the surface of chromosomes during meiosis and mitosis and with the periphery of the pronuclei and nuclei during interphase. I.F.

A86-40875
A BENZODIAZEPINE USED IN THE TREATMENT OF INSOMNIA PHASE-SHIFTS - THE MAMMALIAN CIRCADIAN CLOCK
F. W. TUREK and S. LOSEE-OLSON (Northwestern University, Evanston, IL) Nature (ISSN 0028-0836), vol. 321, May 8, 1986, p. 167, 168. Research supported by the Whitehall Foundation and Upjohn Co. refs
(Contract NIH-HD-09885)

It is reported that the acute administration of triazolam, a short-acting benzodiazepine commonly prescribed for the treatment of insomnia, induces a phase shift in the circadian rhythm of locomotor activity in hamsters. This suggests a role for the GABA-containing neurones in the mammalian circadian system. D.H.

A86-40879
POSITIVELY SUPERCOILED DNA IN A VIRUS-LIKE PARTICLE OF AN ARCHAEBACTERIUM
M. NADAL, G. MIRAMBEAU, M. DUGUET (Paris VI, Universite, France), P. FORTERRE (Institut de Recherche sur le Cancer, Villejuif, France), and W.-D. REITER (Max-Planck-Institut fuer Biochemie, Martinsried, West Germany) Nature (ISSN 0028-0836), vol. 321, May 15, 1986, p. 256-258. refs
(Contract CNRS-ATP-960095)

A86-41043
RNA CATALYSIS AND THE ORIGIN OF LIFE
N. R. PACE and T. L. MARSH (Indiana University, Bloomington) Origins of Life (ISSN 0302-1688), vol. 16, no. 2, 1985, p. 97-116. refs
(Contract NIH-GM-34527)

Until the discovery of catalytic RNAs, first the self-splicing intron in Tetrahymena and then the bacterial RNAse P, cellular enzymes had always seemed to be protein in nature. The recognition that RNA can catalytically make and break phosphodiester bonds simplifies some of the assumptions required of a rudimentary self-replicating entity. Available information on the chemistry of RNA-catalyzed reactions is reviewed, with particular attention to self-splicing introns and tRNA processing by RNAse P. An explicit model for a self-replicating RNA is described. The model postulates a nucleotide binding polymerization site in the RNA, and takes advantage of intrinsic fluidity in RNA higher order structure to dissociate parent and progeny complementary strands. Author

A86-41045* Hebrew Univ. of Jerusalem, Rehovot (Israel).
THE SYNTHESIS OF PRIMITIVE 'LIVING' FORMS - DEFINITIONS, GOALS, STRATEGIES AND EVOLUTION SYNTHESIZERS
N. LAHAV (Jerusalem, Hebrew University, Rehovot, Israel) Origins of Life (ISSN 0302-1688), vol. 16, no. 2, 1985, p. 129-149. Research supported by the Fredric Burk Foundation and NASA. refs

The arbitrariness of the definition of life is discussed in relation to both the archaic biological entities that preceded cells during the Molecular Evolution era, and the hypothetical, primitive, 'living' entities that presumably can be synthesized in the laboratory. Several experimental approaches to the synthesis, detection, and characterization of 'living' entities are discussed. The experimental approaches considered for the synthesis are the constructionist strategy, the whole-environment strategy, and the modular strategy, which is a combination of the first two. The whole-environment strategy is discussed in more detail and the establishment of an Evolution Synthesizer, based on this strategy, is proposed and rationalized. The guidelines for the detection and characterization of populations and processes of 'living' entities include chemical and physical analyses, but are based mainly on the reproductive characterization of these entities. It is expected that the higher the evolutionary level of the 'living' entities, the longer and more difficult it will be to synthesize them, but the easier it will be to detect them. Author

A86-41046* Alabama Univ., Birmingham.
CHIRALLY SELECTIVE, INTRAMOLECULAR INTERACTION OBSERVED IN AN AMINOACYL ADENYLATE ANHYDRIDE
J. C. LACEY, JR., L. M. HALL, D. W. MULLINS, JR., and C. L. WATKINS (Alabama, University, Birmingham) Origins of Life (ISSN 0302-1688), vol. 16, no. 2, 1985, p. 151-156. refs
(Contract NGR-01-010-001)

The interaction between amino acids and nucleotide bases is studied. The proton NMR spectrum of N-acetylphenylalanyl-AMP-anhydride is analyzed H8 and H2 signals, two upfield signals of equal size, and five phenylalanine ring proton signals are observed in the spectrum; the upfield movement of the proton and the racemization of the N-acetyl L-phenylalanine material are examined. The differences in the position of the signals due to the diastereoisomers are investigated. The separation of the D and L amino acyl adenylates using HPLC is described. H-1 NMR spectra of the isomers are examined in order to determine which isomer displays the strongest interaction between the phenyl ring and the adenine ring. The spectra reveal that the L isomer shows the highest upfield change of both H8 and H2 signals. It is noted that the phenyl ring lies over C2 of the adenine ring with the phenyl meta and para protons extended past the adenine ring and the phenyl ortho protons. I.F.

A86-41047
CONSERVATION OF THE SECONDARY STRUCTURE OF PROTEIN DURING EVOLUTION AND THE ROLE OF THE GENETIC CODE
M. A. SOTO, A. SEPULVEDA, and J. TOJA C. (Universidad de Chile, Santiago) Origins of Life (ISSN 0302-1688), vol. 16, no. 2, 1985, p. 157-164. Research supported by the Universidad de Chile and Fondo Nacional de Investigacion Cientifica y Tecnologica. refs

In a group of modern proteins, following an algorithm described by Argyle (1980) it is demonstrated that the ordination of the amino acids in terms of the most frequent substitutions agrees with the conservation of the alpha-helix, beta-sheet, and beta-turn formation tendencies during evolution. The same correspondence has been demonstrated for the conservation of the physicochemical properties in the amino acid substitutions. Both parameters are similar in showing higher correlation with the most frequent amino acid substitutions than with the feasibility of changes at the level of the respective codons. Some kind of restrictions for the expression of the genomic changes, due to the conservation of the secondary structure of proteins and/or the physicochemical properties of the substituted amino acids, could account for the differences found between the distribution of the amino acid substitutions and the most probable codon changes. Author

A86-41784
SPINAL CORD DECOMPRESSION SICKNESS - A COMPARISON OF RECOMPRESSION THERAPIES IN AN ANIMAL MODEL
J. J. W. SYKES, J. M. HALLENBECK, and D. R. LEITCH (U.S. Navy, Naval Medical Research Institute, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 561-568. refs
(Contract NAVY TASK M0099,PN01C,0001)

Recompression therapies for spinal cord decompression sickness (DCS) are described. Male, mongrel dogs were subjected to a dive profile that caused spinal cord DCS. The animals were treated after a delay allowing the lesion to consolidate. One group was recompressed to 60 feet of sea water (fsw) breathing 100 percent oxygen and a second group at 66 fsw breawing 66 percent oxygen. Somatosensory evoked potentials and physiological data for the subjects are analyzed. No differences are detected in the

severity, surface interval before treatment, or the maximum effect of the treatment for the two groups. The differences between the animals that responded and did not respond to the treatments are examined. The advantages and disadvantages of the two treatments are discussed, and it is noted that the efficacy of the therapies are similar. I.F.

A86-41786
POSTRADIATION REGIONAL CEREBRAL BLOOD FLOW IN PRIMATES
L. G. COCKERHAM, T. J. CERVENY, and J. D. HAMPTON (U.S. Armed Forces Radiobiology Research Institute, Bethesda, MD) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 578-582. DNA-supported research. refs

A86-41787
STIMULATING EFFECT OF SPACE FLIGHT FACTORS ON ARTEMIA CYSTS COMPARISON WITH IRRADIATION BY GAMMA RAYS
Y. GAUBIN, B. PIANEZZI, G. GASSET, H. PLANNEL, and E. E. KOVALEV (Toulouse III, Universite, France; Institut Mediko-Biologicheskikh Problem, Moscow, USSR) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 583-590. CNES-supported research. refs

The Artemia cyst, a gastrula in dormant state, is a very suitable material to investigate the individual effects of high charge and high energy cosmic particles. Monolayers of Artemia cysts, sandwiched with nuclear emulsions, flew aboard the Soviet biosatellite Cosmos 1129. The space flight stimulated the developmental capacity expressed by higher percentages of emergence, hatching, and alive nauplii at day 4-5. A greater mean life span was reported in Artemias developed from Artemia cysts hit by the cosmic heavy ions. On earth, Artemia cysts were exposed to 1, 10, 100, 200, and 400 Gy of gamma rays. A stimulating effect on developmental capacity was observed for 10 Gy; the mean life span was significantly increased for this dose. These results are discussed in comparison with previous investigations performed on earth and in space. Author

A86-43422
CIRCULATION AND OXYGEN TENSION IN THE BRAIN OF WAKEFUL RABBITS IN CONDITIONS LEADING TO MOTION SICKNESS [KROVOOBRASHCHENIE I NAPRIAZHENIE KISLORODA V GOLOVNOM MOZGE BODRSTVUIUSHCHIKH KROLIKOV PRI UKACHIVANII]
N. A. SKOROMNYI, I. T. DEMCHENKO, A. I. BEKETOV, and IU. E. MOSKALENKKO (Krymskii Meditsinskii Institut, Simferopol, Ukrainian SSR; AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, March 1986, p. 352-356. In Russian. refs

The effect of vestibular irritation, produced by rocking the animals on a swing, on circulation and oxygen tension (pO2) in the rabbit brain was investigated using the methods of hydrogen clearance and polarography. Systemic arterial pressure was measured in the same animals during a second experimental series, using a catheterized femoral artery. The swinging motion was found to induce increases in total brain circulation, as well as in circulation within regional cortical areas, with the most significant (and the first to appear) changes found in the temporal lobe, followed by the occipital and frontal lobes. The observed changes took place without significant changes in pO2, and did not coincide with the registered alterations in blood pressure, which were inconsistent and variable. It is suggested that the circulation increases were due to a direct dilatory response to the stimuli received from the vestibular analyzer, as well as to activation of the cortical metabolism. I.S.

A86-43423
HEMODYNAMIC CORRELATES OF IMMOBILIZATION STRESS IN RATS [GEMODINAMICHESKIE KORRELIATY IMMOBILIZATSIONNOGO STRESSA U KRYS]
O. S. MEDVEDEV, A. N. MURASHEV, and F. E. MEERTSUK (Institut Eksperimental'noi Kardiologii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, March 1986, p. 363-367. In Russian. refs

The effect of 46-min-long immobilization on systemic and regional hemodynamics was studied in wakeful rats, by measuring arterial pressure, pulse rate, cardiac output, and regional blood flow. Immobilization led to increases in arterial pressure (by 8-12 percent), and cardiac output (by 20-30 percent), and a decrease of total peripheral vascular resistance (by 10 percent). Blood flow increased in skeletal muscles, heart, and adrenals, but decreased in kidneys, spleen, small intestine, and testes. The observed hemodynamic changes are similar to those found in initial stages of hypertonia in man, suggesting that immobilized rats can be used for modeling this condition. I.S.

A86-43424
DEVELOPMENT OF RESPONSES TO NORADRENALIN INJECTION IN CONTROL AND COLD-ADAPTED RATS [RAZVITIE NEKOTORYKH REAKTSII NA VVEDENIE NORADRENALINA U KONTROL'NYKH I ADAPTIROVANNYKH K KHOLODU KRYS]
T. V. KOZYREVA, I. N. SINDAROVSKAIA, and P. V. LAZARENKO (Institut Klinicheskoi i Eksperimental'noi Meditsiny, Novosibirsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, March 1986, p. 377-381. In Russian. refs

A86-43425
PHASES OF MUSCULAR THERMOGENESIS UNDER EXPERIMENTAL HYPERTHYROSIS [FAZY MYSHECHNOGO TERMOGENEZA PRI EKSPERIMENTAL'NOM GIPERTIREOZE]
V. I. SOBOLEV and N. T. LAPENKO (Donetskii Gosudarstvennyi Universitet, Donetsk, Ukrainian SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, March 1986, p. 381-384. In Russian. refs

Heat production in a contracting muscle of hyperthyroid rats was studied under aerobic and anaerobic conditions, for the purpose of correlating the thyroxine-effected heat production with a particular phase of contractile thermogenesis. Thermal effects of muscle contraction were measured by the method of Ivanov et al. (1976, 1978) in three groups of rats, among both aerobic and anaerobic categories: (1) those injected with thyroxin, (2) those injected with dinitrophenol (to uncouple the process of oxidative phosphorylation) and (3) controls. Among the aerobic animals, the values of thermal effect registered in both thyroxin- and dinitrophenol-injected rats were considerably higher (and by similar amounts) than in controls. In anaerobic conditions, the temperature effects of all three groups were equal and much lower than the effects observed in the aerobic category. The results suggest that the increases in heat production effected by thyroxine are related to the secondary, rather than to the initial, phase of contractile thermogenesis. I.S.

A86-43433* California Univ., San Francisco.
COUPLING BETWEEN THE BACTERIORHODOPSIN PHOTOCYCLE AND THE PROTONMOTIVE FORCE IN HALOBACTERIUM HALOBIUM CELL ENVELOPE VESICLES. III - TIME-RESOLVED INCREASE IN THE TRANSMEMBRANE ELECTRIC POTENTIAL AND MODELING OF THE ASSOCIATED ION FLUXES
S. L. HELGERSON, M. K. MATHEW, D. B. BIVIN, P. K. WOLBER (California, University, San Francisco), E. HEINZ (Cornell University, New York) et al. Biophysical Journal (ISSN 0006-3495), vol. 48, Nov. 1985, p. 709-719. refs
(Contract NIH-GM-27057; NIH-GM-26554; NSG-7151)

A86-43434* California Univ., San Francisco.
PHOTOCONVERSION FROM THE LIGHT-ADAPTED TO THE DARK-ADAPTED STATE OF BACTERIORHODOPSIN
T. KOUYAMA, R. A. BOGOMOLNI, and W. STOECKENIUS (California, University, San Francisco) Biophysical Journal (ISSN 0006-3495), vol. 48, Aug. 1985, p. 201-208. refs
(Contract NIH-GM-27057; NSG-7151)

The dark and light adaptation of the bR(trans)570 (bacteriorhodopsin) and bR(cis)550 isomers is analyzed. The equilibrium between the two bR isomers in light-adapted purple membrane films is studied in terms of the wavelength of actinic light and hydration levels. Absorption spectra observed after light adaptations with red and yellow light reveal that red light is less efficient in converting bR(cis)550 to bR(trans)570 than yellow light and the amount of bR(cis)550 in a light-adapted sample increases with decreasing hydration. The rate constants of dark and light adaptation are evaluated; the rate constant of dark adaptation is independent of the hydration level and the rate constant of light adaptation increases with hydration. The acceleration of a dark adaptation by red light is investigated; the dependence of the accelerated dark adaptation on the light intensity is discussed. The action spectrum of light adaptation in a purple membrane suspension is compared with the absorption spectrum of bR(cis)550; correlation between the spectra reveals that cis-to-transconversion is due to excitation of bR(cis)550 and the mechanism of cis-to-trans conversion in film is not affected by humidity levels. It is noted that the light-driven trans-to-cis conversion is a single photon process. The branching at M410 from the all-trans into the 13-cis photocycle is examined. I.F.

A86-43436* California Univ., San Francisco.
TRANSIENT PROTON INFLOWS DURING ILLUMINATION OF ANAEROBIC HALOBACTERIUM HALOBIUM CELLS
S. L. HELGERSON and W. STOECKENIUS (California, University, San Francisco) Archives of Biochemistry and Biophysics (ISSN 0003-9861), vol. 241, Sept. 1985, p. 616-627. refs
(Contract NIH-GM-27057; NSG-7151)

The roles of bacteriorhodopsin (bR), halorhodopsin (hR), and the H(+)-ATPase in the proton uptake in intact cells are examined. The Halobacterium halobium strains and solutions utilized in the experiment, and the techniques for measuring extracellular pH changes and intracellular K(+) concentrations are described. It is observed that in Halobacterium halobium strain R1, containing bR and hR, the light-driven proton uptake is divided into three transient inflows superimposed on the larger proton outflow. Under anaerobic conditions early proton uptake consists of an inflow which can be blocked with Dio-9 and a second inflow that can be eliminated by low concentrations (less than 125 nm) of triphenyltin chloride (TPT). The effects of Dio-9 and TPT on the passive proton-hydroxyl permeability of the cell membrane are investigated. A third transient light-driven proton flow observed at later times of illumination is studied. The data reveal that the first proton inflow correlates with proton dependent ATP synthesis; the second inflow is a passive uptake through an unidentified channel in response to electrogenic chloride pumping by bR and/or hR; and the third inflow correlates with the Na(+)/H(+) antiporter function. I.F.

A86-43438* Santa Clara Univ., Calif.
HALOBACTERIUM DENITRIFICANS SP. NOV., AN EXTREMELY HALOPHILIC DENITRIFYING BACTERIUM
G. A. TOMLINSON (Santa Clara, University, CA), L. L. JAHNKE, and L. I. HOCHSTEIN (NASA, Ames Research Center, Moffett Field, CA) International Journal of Systematic Bacteriology (ISSN 0020-7713), vol. 36, Jan. 1986, p. 66-70. refs

Halobacterium denitrificans was one of several carbohydrate-utilizing, denitrifying, extremely halophilic bacteria isolated by anaerobic enrichment in the presence of nitrate. Anaerobic growth took place only when nitrate (or nitrite) was present and was accompanied by the production of dinitrogen. In the presence of high concentrations of nitrate (i.e., 0.5 percent), nitrous oxide and nitrite were also detected. When grown aerobically in a mineral-salts medium containing 0.005 percent yeast extract, H. denitrificans utilized a variety of carbohydrates as sources of carbon and energy. In every case, carbohydrate utilization was accompanied by acid production. Author

A86-43440* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MEASUREMENT AND PREDICTION OF FLOW THROUGH A REPLICA SEGMENT OF A MILDLY ATHEROSCLEROTIC CORONARY ARTERY OF MAN
L. H. BACK, J. R. RADBILL, Y. I. CHO (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), and D. W. CRAWFORD (Southern California, University, Los Angeles) Journal of Biomechanics (ISSN 0021-9290), vol. 19, no. 1, 1986, p. 1-17. refs
(Contract NAS7-100)

Pressure distributions were measured along a hollow vascular axisymmetric replica of a segment of the left circumflex coronary artery of man with mildly atherosclerotic diffuse disease. A large range of physiological Reynolds numbers from about 60 to 500, including hyperemic response, was spanned in the flows investigation using a fluid simulating blood kinematic viscosity. Predicted pressure distributions from the numerical solution of the Navier-Stokes equations were similar in trend and magnitude to the measurements. Large variations in the predicted velocity profiles occurred along the lumen. The influence of the smaller scale multiple flow obstacles along the wall (lesion variations) led to sharp spikes in the predicted wall shear stresses. Reynolds number similarity was discussed, and estimates of what time averaged in vivo pressure drop and shear stress might be were given for a vessel segment. Author

A86-43442* Arizona Univ., Tucson.
METABOLISM OF AMINO ACIDS BY THE ATROPHIED SOLEUS OF TAIL-CASTED, SUSPENDED RATS
S. R. JASPERS, S. JACOB, and M. E. TISCHLER (Arizona, University, Tucson) Metabolism (ISSN 0026-0495), vol. 35, March 1986, p. 216-223. refs
(Contract NAGW-227)

A86-43444* Utah Univ., Salt Lake City.
EFFECTS OF N,N,N',N'-ETHYLENEDIAMINETETRAMETHYLENE PHOSPHONIC ACID AND 1-HYDROXYETHYLIDENE-1,1-BISPHOSPHONIC ACID ON CALCIUM ABSORPTION, PLASMA CALCIUM, LONGITUDINAL BONE GROWTH, AND BONE HISTOLOGY IN THE GROWING RAT
S. C. MILLER, W. S. S. JEE, D. M. WOODBURY, and J. W. KEMP (Utah, University, Salt Lake City) Toxicology and Applied Pharmacology (ISSN 0041-008X), vol. 77, 1985, p. 230-239. refs
(Contract PHS-DE-06007; PHS-AM-31844; NAG2-108)

A86-43448* Texas Technological Univ., Lubbock.
ROLE OF CARBONIC ANHYDRASE IN BONE - PARTIAL INHIBITION OF DISUSE ATROPHY OF BONE BY PARENTERAL ACETAZOLAMIDE
A. D. KENNY (Texas Tech University, Lubbock) Calcified Tissue International (ISSN 0008-0594), vol. 37, 1985, p. 126-133. refs
(Contract NSG-2137; NIH-AM-19475)

The effectiveness of orally and subcutaneously administered acetazolamide sodium in preventing denervation-induced bone loss in rats is examined. Male Sprague-Dawley rats were treated with acetazolamide either orally by incorporation of 0.2, 0.5, or 1.5 percent concentrations in their diet for 15 days, or subcutaneously by either injection of 0.5 ml/rat of a solution containing either 20 or 100 mg/ml of the drug twice daily for 15 days or by continuous infusion of 5, 50, 500, or 1000 mg/ml of acetazolamide sodium for 8 days using an osmotic minipump. The effects of acetazolamide on body weight, food consumption, and plasma calcium content are evaluated. It is observed that parenteral administration is equally effective as oral administration in partially preventing denervation-induced bone mass changes. The data reveal that approximately 50 percent protection occurs with daily doses of 1094, 129, and 8 mg/kg body weight for the oral, subcutaneous injection, and subcutaneous infusion methods, respectively. I.F.

A86-43449* Texas Technological Univ., Lubbock.
ROLE OF CARBONIC ANHYDRASE IN BONE RESORPTION INDUCED BY 1,25 DIHYDROXYVITAMIN D3 IN VITRO
G. E. HALL and A. D. KENNY (Texas Tech University, Health Science Center, Lubbock) Calcified Tissue International (ISSN 0008-0594), vol. 37, 1985, p. 134-142. refs
(Contract NSG-2137; NIH-AM-19475)

The calvaria of 5-to-6-day-old mice treated with 1 x 10 to the -8th M of 1,25(OH)2D3 in vitro for 48 hours are examined in order to study the function of carbonic anhydrase in bone resorption. Calcium concentrations in the culture were measured to assess bone resorption. It is observed that 1,25(OH)2D3 effectively stimulates bone resorption in vitro and the resorption is dose-dependent. The effects of azetazolamide on 1,25(OH)2D3-induced bone resorption are investigated. The data reveal that 1,25(OH)2D3-induced calcium release is associated with an increase in the carbonic anhydrase activity of bone, and bone alkaline phosphatase activity is decreased and acid phosphatase activity is increased in response to 1,25(OH)2D3. A two-fold mechanism for 1,25(OH)2D3-induced bone resorption is proposed; the first mechanism is an indirect activation of osteoclasts and the second involves an interaction between hormone and osteoclast precursors. I.F.

A86-43450* Utah Univ., Salt Lake City.
THE EFFECTS OF PROSTAGLANDIN E2 IN GROWING RATS - INCREASED METAPHYSEAL HARD TISSUE AND CORTICO-ENDOSTEAL BONE FORMATION
W. S. S. JEE, K. UENO, Y. P. DENG, and D. M. WOODBURY (Utah, University, Salt Lake City) Calcified Tissue International (ISSN 0008-0594), vol. 37, 1985, p. 148-157. refs
(Contract NIH-AM-27029; NAG2-108; DE-AC02-76EV-00119)

The role of in vivo prostaglandin E2 (PGE2) in bone formation is investigated. Twenty-five male Sprague-Dawley rats weighing between 223-267 g were injected subcutaneously with 0.3, 1.0, 3.0, and 6.0 mg of PGE2-kg daily for 21 days. The processing of the tibiae for observation is described. Radiographs and histomorphometric analyses are also utilized to study bone formation. Body weight, weights of soft tissues and bones morphometry are evaluated. It is observed that PGE2 depressed longitudinal bone growth, increased growth cartilage thickness, decreased degenerative cartilage cell size and cartilage cell production, and significantly increased proximal tibial metaphyseal hard tissue mass. The data reveal that periosteal bone formation is slowed down at higher doses of PGE2 and endosteal bone formation is slightly depressed less than 10 days post injection; however, here is a late increase (10 days after post injection) in endosteal bone formation and in the formation of trabecular bone in the marrow cavity of the tibial shaft. It is noted that the effects of PGE2 on bone formation are similar to the responses of weaning rats to PGE2. I.F.

A86-43453* Texas Technological Univ., Lubbock.
ROLE OF CARBONIC ANHYDRASE IN BONE RESORPTION INDUCED BY PROSTAGLANDIN E2 IN VITRO
G. E. HALL and A. D. KENNY (Texas Tech University, Health Science Center, Lubbock) Pharmacology (ISSN 0031-7012), vol. 30, 1985, p. 339-347. refs
(Contract NSG-2137; NIH-AM-19475)

The possible role of carbonic anhydrase in bone resorption induced by prostaglandin E2 (PGE2) was studied using an in vitro neonatal mouse calvarial culture system. PGE2 (10 to the -6th M) was effective in stimulating resorption, as assessed by calcium release into culture media. This enhanced resorption was accompanied by significant increases in calvarial carbonic anhydrase activity over control values at 48 and 96 h. At 48 h, bones treated with PGE2 had 20 percent more carbonic anhydrase activity than controls. By 96 h, treated bones contained 79 percent more carbonic anhydrase activity than controls. PGE2-induced bone resorption was inhibited by the carbonic anhydrase inhibitor acetazolamide in a dose-dependent fashion from 10 to the -5th to 10 to the -4th M with 77 percent inhibition observed at 10 to the -4th M. The acetazolamide analogue CL 13,850 (N-t-butylacetazolamide), which does not inhibit carbonic anhydrase, failed to inhibit PGE2-induced resorption. These results are consistent with the hypothesis that carbonic anhydrase is a necessary component of the osteoclastic bone resorptive mechanism. Author

A86-43454* Texas Technological Univ., Lubbock.
ROLE OF CARBONIC ANHYDRASE IN BONE - PLASMA ACETAZOLAMIDE CONCENTRATIONS ASSOCIATED WITH INHIBITION OF BONE LOSS
A. D. KENNY (Texas Tech University, Health Science Center, Lubbock) Pharmacology (ISSN 0031-7012), vol. 31, 1985, p. 97-107. refs
(Contract NSG-2137; NIH-AM-19475)

The effects of acetazolamide and benzolamide on bone formation are examined. Solutions of acetazolamide and benzolamide with 1 M THAM/tris(hydromethyl)aminoethane/ or without 1 M THAM were injected subcutaneous with a minipump and into the food of Sprague-Dawley rats. The data reveal that for 8-day and 12-day infusions only acetazolamide combined with 1 M THAM caused any reduction in bone loss and there were no changes in body weights, food consumption and plasma calcium and phosphorus values. Following 8 days of infusion of acetazolamide with 1 M THAM at infusion rates of 0.5, 5.0, and 50 micrograms/hr, no reduction was detected at 0.5 microgram/hr, a 30 percent reduction occurred at 5.0 micrograms/hr and a 49 percent decrease at 50 micrograms/hr. In the benzolamide experiment it was observed that 0.5 percent of the solution in the food caused no reduction in bone loss; however, infusions with benzolamide plus 1 M THAM resulted in a bone loss reduction of 30 percent at 5.0 micrograms/hr, and a 49 percent decrease at 50 micrograms/hr. Acetazolamide levels in the plasma at 50 micrograms/hr doses are calculated as ranging from 99 ng/ml-223 ng/ml and as 46 ng/ml at 5 micrograms/hr doses. I.F.

N86-28606*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
US MONKEY AND RAT EXPERIMENTS FLOWN ON THE SOVIET SATELLITE COSMOS 1514
R. C. MAINS, ed. and E. W. GOMERSALL, ed. May 1986 284 p
(NASA-TM-88223; A-86147; NAS 1.15:88223) Avail: NTIS HC A13/MF A01 CSCL 06C

On December 14, 1983, the U.S.S.R. launched Cosmos 1514, an unmanned spacecraft carrying biological and radiation physics experiments from nine countries, including five from the United States. This was the fourth flight with U.S. experiments aboard one of the Soviet unmanned spacecraft. The Cosmos 1514 flight was limited to five days duration because it was the first nonhuman primate flight. Cosmos 1514 marked a significant departure from earlier flights both in terms of Soviet goals and the degree of cooperation between the U.S.S.R. and the United States. This flight included more than 60 experiments on fish, crawfish eggs, plants and seeds, 10 Wistar pregnant rats, and 2 young adult rhesus monkeys as human surrogates. United States specialist participated in postflight data transfer and specimen transfer, and conducted rat neonatal behavioral studies. An overview of the mission is presented focusing on preflight, on-orbit, and postflight activites pertinent to the five U.S. experiments aboard Cosmos. Author

N86-28607# Pittsburgh Univ., Pa.
ENZYME COFACTOR MODIFIED ELECTRODES Final Report, 8 Feb. 1982 - 31 Dec. 1985
L. B. WINGARD, JR. 19 Feb. 1986 6 p
(Contract DAAG29-82-K-0064)
(AD-A165604; ARO-18310.16-CH) Avail: NTIS HC A02/MF A01 CSCL 07D

This work was focused on the study of flavin cofactor enzymes for the development of improved oxidation-reduction enzyme electrodes for eventual use in biosensors or other electrochemical systems. Flavin adenine dinucleotide or glucose oxidase were immobilized on different types of carbon electrodes and tested

for electrochemical and enzymatic activity. Diffusional studies also were carried out to determine the diffusional resistance of the immobilization matrix. GRA

N86-28608# Letterman Army Inst. of Research, San Francisco, Calif.
ACUTE ORAL TOXICITY (LD50) OF GUANIDINE HYDROCHLORIDE IN RATS Final Report, 19 Jan. - 14 Feb. 1984
E. W. MORGAN, S. K. SANO, and D. W. KORTE, JR. Aug. 1985 105 p
(AD-A165747; LAIR-204; TOXICOLOGY-SER-77) Avail: NTIS HC A06/MF A01 CSCL 06T

Nitroguanidine is being evaluated by the US Army as a replacement for the nitrocellulose component of certain propellants/munitions. One of the by-products to be tested is guanidine. The hydrochloride salt was used in this evaluation of the acute toxicity of guanidine. The acute oral toxicity of guanidine hydrochloride was determined in male and female Sprague-Dawley rats by using the oral gavage single-dose method. The LD50 + or - S.E. for male rats was 556.5 + or - 29.7 mg(base)/kg and 474.6 + or - 35.3 mg(base)/kg for female rats. Clinical signs were observed in both the gastrointestinal (GI) tract and the central nervous system-neuromuscular junction (CNS-NM). Symptoms referrable to the GI tract included increased salivation, hunched posture, and diarrhea. CNS-NM signs included disorientation, increased startle reflex, hyperactivity, jumping behavior, presence of tremors/twitching and depression of grasping and righting reflexes. These results place guanidine hydrochloride in slightly toxic and moderately toxic ranges respectively. GRA

N86-28609# California Inst. of Tech., Pasadena. Div. of Biology.
INFORMATION PROCESSING IN MAMMALIAN VISUAL CORTEX Interim Report, 1 Dec. 1984 - 30 Nov. 1985
D. C. VANESSEN 26 Feb. 1986 26 p
(Contract N00014-85-K-0068)
(AD-A165832) Avail: NTIS HC A03/MF A01 CSCL 06P

This report used a combination of physiological and anatomical approaches to elucidate the functional organization of the visual cortex in the macaque monkey. One project was a single cell analysis of texture vision, using texture patterns of the type developed by Julesz for human psychophysical studies. Many cells tested in area V2 responded to static or moving texture gradients in ways which were not predictable on the basis of responses to individual texture elements and which correlated with the preattentive discriminability of these texture patterns to human observers. A second project involved the development of a computerized technique for generating two-dimensional maps of cerebral cortex. An algorithm based on simulated annealing procedures was used to construct a complete map of primary visual cortex, thereby demonstrating its suitability for dealing with anatomical data from highly convoluted regions of cortex. A third project involved the use of voltage-sensitive dyes to monitor activity patterns in visual cortex. This technique offers great promise for analyzing the organization of large neural ensembles with high spatial and temporal resolution. GRA

N86-28610# Joint Publications Research Service, Arlington, Va.
USSR REPORT: LIFE SCIENCES. BIOMEDICAL AND BEHAVIORAL SCIENCES
19 May 1986 106 p Transl. into ENGLISH from various Russian articles
(JPRS-UBB-86-009) Avail: NTIS HC A06/MF A01

Progress is reported in U.S.S.R. biomedical and behavioral sciences. Topics discussed include: agrotechnology; biophysics; biotechnology; ecology; environment; epidemiology; food technology; genetics; immunology; laser effects; marine mammals; medicine; microbiology; molecular biology; niemr; pharmacology and toxicology; physiology; public health; and psychiatry.

N86-29484# General Accounting Office, Washington, D. C.
BIOTECHNOLOGY: THE US DEPARTMENT OF AGRICULTURE'S BIOTECHNOLOGY RESEARCH EFFORTS
Oct. 1985 80 p
(GAO/RCED-86-39BR) Avail: NTIS HC A05/MF A01

Topics discussed include: United States Department of Agriculture biotechnology research efforts; funding; accomplishments; institutions receiving grants; and the state experimental stations and colleges of veterinary science. Author

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-40231
QUANTIFICATION OF PILOT FATIGUE - A NEW APPROACH TO A CRUCIAL PROBLEM
J. A. PRELOOKER (Aerolineas Argentinas, Buenos Aires, Argentina) International Journal of Aviation Safety (ISSN 0264-6803), vol. 3, Sept. 1985, p. 197-204. refs

Attention is given to a method for the quantification of pilot fatigue in human factors safety management, classifying the various causative factors involved according to their role in agression/defense response mechanisms. These factors are further subdivided as causal or generative, circumstantial or catalytic, and personal or potentiating. Emphasis is given to circumstantial or catalytic factors, which are judged to be especially relevant to the task of quantification. The method has been used over the 1979-1983 period in a study conducted by the Ibero-Americal Pilots' Organization; this study revealed that blood lactic acid levels and psychometric tests based on electronic games are highly reliable indicators of flight fatigue. O.C.

A86-40566
PHYSIOLOGICAL PROBLEMS OF ASCENT TO ALTITUDE
R. HARDING (RAF, Institute of Aviation Medicine, Farnborough, England) International Journal of Aviation Safety (ISSN 0264-6803), vol. 3, Dec. 1985, p. 242-244.

The causes, effects, and treatment of physiological hazards associated with ascent to altitude are discussed. The use of cabin pressurization systems (maintain cabin pressure at 6000-8000 ft) and oxygen masks to counter the fall in partial pressure of oxygen that occurs during ascent is examined. The symptoms of hypoxia which include impaired judgment and memory, mental and muscular incoordination, and respiratory changes are studied. The training of aircrew to recognize the personal effects of hypoxia are conducted in hypobaric chambers. The effects of rapid decompression and compression in military and civil aircraft on the lungs, gut, teeth, middle ear cavities, and sinuses are analyzed. Methods for controlling hyperventilation which results from anxiety or emotional stress during flight are described. I.F.

A86-40660*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
WATER AND ELECTROLYTES
J. E. GREENLEAF and M. H. HARRISON (NASA, Ames Research Center, Moffett Field, CA) IN: Nutrition and Aerobic Exercise. Washington, DC, American Chemical Society , 1986, p. 107-124. refs

It has been found that the performance of the strongest and fittest people will deteriorate rapidly with dehydration. The present paper is concerned with the anatomy of the fluid spaces in the body, taking into account also the fluid shifts and losses during exercise and their effects on performance. Total body water is arbitrarily divided into that contained within cells (cellular) and that located outside the cells (extracellular). The anatomy of body fluid compartments is considered along with the effects of exercise on

body water, fluid shifts with exercise, the consequences of sweating, dehydration and exercise, heat acclimatization and endurance training, the adverse effects of dehydration, thirst and drinking during exercise, stimuli for drinking, and water, electrolyte, and carbohydrate replacement during exercise. It is found that the deterioration of physical exercise performance due to dehydration begins when body weight decreases by about 1 percent. G.R.

A86-40584* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PHASE SHIFTING TWO COUPLED CIRCADIAN PACEMAKERS - IMPLICATIONS FOR JET LAG
P. H. GANDER, R. E. KRONAUER, and R. C. GRAEBER (NASA, Ames Research Center, Moffett Field, CA; Harvard University, Cambridge, MA) American Journal of Physiology: Regulatory, Integrative and Comparative Physiology (ISSN 0363-6119), no. 249, 1985, p. R704-R719. refs

Two Van der Pol oscillators with reciprocal linear velocity coupling are utilized to model the response of the human circadian timing system to abrupt displacements of the environmental time cues (zeitgebers). The core temperature rhythm and sleep-wake cycle simulated by the model are examined. The relationship between the masking of circadian rhythms by environmental variables and behavioral and physiological events and the rates of resynchronization is studied. The effects of zeitgeber phase shifts and zeitgeber strength on the resynchronization rates are analyzed. The influence of intrinsic pacemakers periods and coupling strength on resynchronization are investigated. The simulated data reveal that: resynchronization after a time zone shift depends on the magnitude of the shift; the time of day of the shift has little influence on resynchronization; the strength of zeitgebers affects the rate and direction of the resynchronization; the intrinsic pacemaker periods have a significant effect on resynchronization; and increasing the coupling between the oscillators results in an increase in the rate of resynchronization. The model data are compared to transmeridian flight studies data and similar resynchronization patterns are observed. I.F.

A86-41400
AN AUTOMATED SYSTEM FOR ST SEGMENT AND ARRHYTHMIA ANALYSIS IN EXERCISE RADIONUCLIDE VENTRICULOGRAPHY
P.-W. HSIA, J. M. JENKINS, K. P. GAGE, J. T. SANTINGA (Michigan, University, Ann Arbor), Y. SHIMONI (Elscint, Ltd., Haifa, Israel) et al. IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, June 1986, p. 585-593. Research supported by Elscint, Ltd. refs
(Contract NSF ECS-83-51215)

A86-41645
WHAT IS THE PARAMETERS FOR THE PREDICTION OF SEASICKNESS SUSCEPTIBILITY? - ON THE POINT OF VIEW FOR VISUAL-VESTIBULAR-SOMATOSENSORY INTERACTION
S. KOTAKA (Tokyo Metropolitan Toshima Hospital, Japan), W. BLES (Amsterdam, Vrije Universiteit, Netherlands), and I. WATANABE (Tokyo Medical and Dental University, Japan) Japanese Journal of Aerospace and Environmental Medicine (ISSN 0387-0723), vol. 22, June 1985, p. 14-22. In Japanese, with abstract in English. refs

Laboratory experiments were carried out with 60 humans in an attempt to identify predictors of seasickness susceptibility. The subjects were divided into controls and a group that underwent tilting-room trials. No correlations were observed between semicircular canal imbalances and the susceptibility of seasickness. Stabilimetry measurements indicated that the subjects more susceptible to seasickness were more visually oriented than were those who did not become ill. The susceptibles also exhibited postural imbalances at lower and higher frequencies of the tilts than did those who were not susceptible. The normalcy of horizon perception during tilts and the visual-oculomotor reflex function of the susceptibles indicated that the onset of seasickness may be due to disturbances within the interaction of the visual-vestibular-somatosensory interaction. The rates and types of information available to this system are different in special environments than they are on the ground. M.S.K.

A86-41779* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
CARDIOVASCULAR RESPONSES OF WOMEN TO LOWER BODY NEGATIVE PRESSURE
M. A. B. FREY, K. L. MATHES, and G. W. HOFFLER (NASA, Kennedy Space Center; Bionetics Corp., Cocoa Beach, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 531-538. refs

The effects of lower body negative pressure (LBNP) on the cardiovascular response of 20 women between 23-43 years are evaluated. Calf circumference and cardiovascular data were recorded for women in the follicular and luteal phases of the menstrual cycle at -30, -40, and -50 mm Hg LBNP. The data reveal that the two menstrual phases did not cause differences in the way women respond to LBNP. It is observed that during LBNP calf circumference is enlarged; transthoracic impedance, and heart rate are increased; stroke volume, left ventricular ejection time, the Heather Index of contractility and systolic pressure, and cardiac output are reduced; and total peripheral resistance is elevated. The experimental data are compared to Montgomery et al. (1979). It is noted that the response of women to -50 mm Hg LBNP is similar to that of men; however, women adapt to stresses on the cardiovascular system with greater heart rate adjustments. I.F.

A86-41780* Louisiana State Univ., Shreveport.
THE EFFECT OF ANTIMOTION SICKNESS DRUGS ON HABITUATION TO MOTION
C. D. WOOD, J. E. MANNO, B. R. MANNO, R. C. ODENHEIMER, and L. E. BAIRNSFATHER (Louisiana State University, Medical Center, Shreveport) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 539-542. refs
(Contract NAS9-16801)

The mechanism which allows for increased exposure to motion and accelerates habituation is investigated. The responses of 12 male and female subjects between 18-30 years rotated once a day for 5 days on the Contraves Goerz rotating chair after receiving placebo, 10 mg d-amphetamine, 0.6 mg scopolamine with 5 mg d-amphetamine, and 1.0 mg scopolamine are studied. It is observed that with placebo the subjects performed 48 more head movements than untreated subjects, 118 more movements with d-amphetamine, 176 more with 0.6 mg scopolamine with d-amphetamine, and 186 more with 1.0 scopolamine. The data reveal that exposure to rotation increases tolerance from 88 head movements on day 2 to 159 on day 4 at 17.4 rpm and with placebo; 96 to 186 at 19.9 rpm with 10 mg d-amphetamine; 111 to 273 at 20.2 rpm with scopolamine with d-amphetamine, and 141 to 279 at 22.4 rpm with 1.0 mg scopolamine. It is noted that a combination of cholinergic blocking and norepinephrine activation action is most effective in preventing the development of motion sickness and habituation is due to the greater exposure to vestibular simulation permitted by the drugs. I.F.

A86-41781
EFFECT OF SPIRONOLACTONE ON ACUTE MOUNTAIN SICKNESS
R. F. LARSEN, P. B. ROCK, C. S. FULCO, B. EDELMAN, A. J. YOUNG (U.S. Army, Research Institute of Environmental Mecidine, Natick, MA) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 543-547. refs

This study examined the effectiveness of spironolactone as a prophylactic agent for the prevention of acute mountain sickness (AMS). Spironolactone, 25 mg PO QID, or placebo was administered to nine subjects in a double-blind, placebo-controlled, crossover design. Medication was given for 48 h prior to and during a 46-h exposure to 427 mm Hg (4570 m) in a hypobaric chamber. Six subjects demonstrated prevention of either the cerebral or respiratory symptoms of AMS during at least one segment of the altitude sojourn. Author

A86-41782* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DISPLACEMENT THRESHOLDS IN CENTRAL AND PERIPHERAL VISION DURING TRACKING
R. F. HAINES (NASA, Ames Research Center, Moffett Field, CA) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 548-554. refs

The effects of stimulus duration and angular velocity on a subject's judgment of displacement threshold are examined. Twenty-six male subjects between 17-45 years with uncorrected 20:20 distance acuity and normal color perception and stereopsis studied a series of forced choice, paired comparison trials in which a long, thin, collimated horizontally oriented line moved downward through 12 angles ranging from 0.6-60 arcmin and judged which stimulus moved in each pair. The displacements were produced by 0.25, 0.5, 1, 2, and 4 sec stimulus duration and 2.5, 5, 10, and 15 deg/sec angular rates. Stimulus velocity, stimulus duration, mean threshold displacement, and mean confidence results are analyzed. It is observed that displacement judgment accuracy is increased with increasing stimulus duration. The data are compared with the results of Johnson and Leibowitz (1976) and Johnson and Scobey (1982), and good correlation with the Johnson and Leibowitz data is detected. The data reveal that threshold is based on a constant stimulus velocity over this range of durations and velocities. The data are applicable to the study of the final approach to landing of medium and large commercial jet aircraft. I.F.

A86-41783
THE DETECTION OF VARIOUS COLOR COMBINATIONS UNDER DIFFERENT CHROMATIC AMBIENT ILLUMINATIONS
D. F. NERI, S. M. LURIA, and D. A. KOBUS (U.S. Navy, Naval Submarine Medical Research Laboratory, Groton, CT) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 555-560. refs
(Contract NAVY TASK M0100,001,1022)

The purpose of this study was to reveal the effects of ambient illumination color and various foreground/background color pairings on a choice reaction time task performed on a color CRT. Six men and two women with normal color vision served as observers in a four-alternative forced choice procedure. A small (18 arcmin visual angle) colored circle appeared in the center of one of the unmarked quadrants of the screen. The observer's task was to respond as quickly as possible to this target by pressing one of four buttons corresponding to its location. It is found that target colors that were opponent to the background colors were most quickly detected. Detection was enhanced by maximizing both brightness and chromatic contrast, but brightness contrast was much more effective. Chromatic ambient lighting which was a log unit dimmer than the target luminance had no effect on performance. Author

A86-41785
RESPONSE OF ENLARGED ALVEOLAR VESSELS TO ACUTE HYPOXIA
W. C. MILLER, J. G. HEARD, D. M. SUICH, and K. M. UNGER (Humana Hospital, Pulmonary Center, Webster, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 575-577. refs

Because the postulated mechanism of high altitude pulmonary edema is inhomogeneous vasconstriction and hyperperfusion of unconstricted vessels, pulmonary blood flow through vessels larger than 10 microns was determined at baseline and during acute hypoxia sufficient to reduce arterial oxygen saturation to 65 percent. Women demonstrated a uniform response of decreasing such flow, whereas responses in men were highly variable. Hyperfusion of enlarged vessels during hypoxia is not an acute phenomenon in the majority of subjects and is therefore either unique to some individuals or a subacute occurrence. Author

A86-41788
INTRAVENTRICULAR CONDUCTION DISTURBANCES IN FLYING PERSONNEL RIGHT BUNDLE BRANCH BLOCK
G. CANAVERIS (Instituto Nacional de Medicina Aeronautica y Espacial, Buenos Aires, Argentina) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 591-596. refs

Fourty-one cases of complete right bundle branch block detected in a population of 6915 male, civilian flyers in Argentina are studied. The block was obeserved in 17 subjects in the first ECG and in 24 after normal ECG tracing. The effects of complete right bundle branch block development on the electrical axis are analyzed. It is observed that the block is most prevalent in men in the 35-44 year range. The cause of this block is investigated. It is noted that complete right bundle branch block etiology in asymptomatic subjects is uncertain and prognosis depends on the underlying disease. I.F.

A86-41789
CARDIOVASCULAR EPIDEMIOLOGY, EXERCISE, AND HEALTH - 40-YEAR FOLLOWUP OF THE U.S. NAVY'S '1000 AVIATORS'
E. YORK, R. E. MITCHELL, and A. GRAYBIEL (U.S. Naval Aerospace Medical Center, Aerospace Medical Research Laboratory, Pensacola, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 597-599. refs

A86-41790
A BLITZ OF BENDS - DECOMPRESSION SICKNESS IN FOUR STUDENTS AFTER HYPOBARIC CHAMBER TRAINING
S. E. PIWINSKI, R. A. MITCHELL (U.S. Army, School of Aviation Medicine, Fort Rucker, AL), G. A. GOFORTH (U.S. Army, Flight Surgeon's Office, Fort Benning, GA), H. J. C. SCHWARTZ, and F. K. BUTLER, JR. (U.S. Navy, Panama City, FL) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, June 1986, p. 600-602.

Four cases of decompression sickness in U.S. Army parachutists, which occurred after exposure in a hypobaric chamber to 9,908.5 m followed by a rapid compression to 6,859.8 m, are analyzed. The high altitude-low opening (HALO) flight profile followed by the parachutists is described. The diagnosis and treatment of the sickness are discussed. The oxygen regulators and oxygen supply of the chamber were checked, and it was determined the regulators were functioning properly and the oxygen was pure. The cause of the decompression sickness is examined. It is noted that this HALO flight profile is not utilized by the U.S. Navy or U.S. Air Force and should be considered unsafe for future training. I.F.

A86-43437* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
ON THE BIOLOGICAL HAZARD OF GALACTIC ANTINUCLEI
J. W. WILSON, L. W. TOWNSEND (NASA, Langley Research Center, Hampton, VA), and W. W. BUCK (Hampton University, VA) Health Physics (ISSN 0017-9078), vol. 50, May 1986, p. 666, 667. refs

The interaction of antinuclei in the galactic cosmic-ray beam with biological systems is studied. A nuclei-antinuclei annihilation event observed in nuclear emulsion near the end of the slowing-down trajectories of singly charged particle is discussed. An annihilation event that occurred by capture of the antinucleus into an atomic orbital followed by cascade to or near the ground atomic state and subsequent annihilation with the nuclear material of the atom is described. Microdosimetric quantities relevant to potential biological hazards are estimated. The average linear-energy-transfer spectrum for galactic cosmic ray antinuclei annihilation events in tissues is presented. It is observed that the annihilation in tissues occurs mainly in O and the heavier elements around K. I.F.

N86-28611# Joint Publications Research Service, Arlington, Va.
RESISTANCE, EXCHANGE, AND CAPACITANCE FUNCTIONS OF SKELETAL MUSCLE VESSELS IN ACUTE HYPOXIC HYPOXIA
B. I. TKACHENKO and Y. I. IBRAGIMOV *In its* USSR Report: Life Sciences. Biomedical and Behavioral Sciences (JPRS-UBB-86-009) p 71-72 19 May 1986 Transl. into ENGLISH from Fiziologicheskiy Zhurnal SSSR (Leningrad, USSR), v. 81, no. 10, Oct. 1985 p 1229-1237
Avail: NTIS HC A06/MF A01

It is shown that acute hypoxia (10 percent O2 in nitrogen) increases precapillary resistance of skeletal muscle vessels in hemodynamically isolated cats. Postcapillary resistance was reduced by about 30 percent together with capillary hydrostatic pressure and the capillary filtration coefficient (CFC). Similar changes were observed in the denervated vascular bed under cross circulation. B.W.

N86-28612* National Aeronautics and Space Administration, Washington, D.C.
AEROSPACE MEDICINE AND BIOLOGY: A CONTINUING BIBLIOGRAPHY WITH INDEXES (SUPPLEMENT 286)
Jul. 1986 77 p
(NASA-SP-7011(286); NAS 1.21:7011(286)) Avail: NTIS HC A05 CSCL 06E

This bibliography lists 213 reports, articles and other documents introduced into the NASA scientific and technical information system in June 1986. Author

N86-28613*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CREW FACTORS IN FLIGHT OPERATIONS. PART 4: SLEEP AND WAKEFULNESS IN INTERNATIONAL AIRCREWS
R. C. GRAEBER Feb. 1986 113 p
(Contract NCC2-302)
(NASA-TM-88231; A-86182; NAS 1.15:88231) Avail: NTIS HC A06/MF A01 CSCL 06P

Physiological recordings of sleep and wakefulness in operating international (B-747) flight crews were obtained. Crews spent their first layover (48 h) of a trip in a sleep laboratory where standardized EEG, electro-oculograph (EOC), and electromyograph (EMG) sleep recordings were carried out whenever volunteers chose to sleep. During periods of wakefulness they underwent multiple sleep latency tests every 2 h in order to assess daytime drowsiness. The same standardized recordings were carried out at a home-based laboratory before departure. Approximately four crews each participated in flights over 7 to 9 time zones on five routes. All participants were encouraged to use whatever sleep-wake strategies they thought would provide them with the most satisfactory crew rest. Overall, layover sleep quality was not seriously disturbed, but eastward flights produced greater sleep disruption. The contributors of individual factors and the usefulness of various sleep strategies are discussed in the individual laboratory reports and in an operational summary. Author

N86-28614# Armed Forces Radiobiology Research Inst., Bethesda, Md.
AFRRI (ARMED FORCES RADIOBIOLOGY RESEARCH INSTITUTE) Annual Research Report, 1 Oct. 1984 - 30 Sep. 1985
30 Sep. 1985 101 p
(AD-A165810; AFRRI-ARR-19) Avail: NTIS HC A06/MF A01 CSCL 06R

The Armed Forces Radiobiology Research Inst.(AFRRI) is the primary DOD facility for scientific research in the field of radiobiology and related matters. It conducts applied and basic research that is essential for the operational and medical support of the DOD. The work carried out by its five scientific departments is noted. Operation, maintenance, and quality control of all AFFRI radiation sources, radiation dosimetry and estimation of tissue doses at various depths in different kinds if tissues; development and use of nuclear medicine and magnetic spectroscopic techniques for determining radiation damage in animals and model systems. GRA

N86-28615# Health Effects Research Lab., Research Triangle Park, N. C.
APPLICATION OF PORTABLE MICROPROCESSOR-BASED SYSTEM FOR ELECTROPHYSIOLOGICAL FIELD TESTING OF NEUROTOXICITY
D. OTTO, S. BAUMANN, and G. ROBINSON Jan. 1986 19 p refs Prepared in cooperation with Illinois Univ., Urbana-Champaign and North Carolina Univ., Chapel Hill
(PB86-145471; EPA-600/D-86-008) Avail: NTIS HC A02/MF A01 CSCL 06T

A portable microprocessor based system designated PEARL II was developed for neurotoxicity testing in human populations. PEARL II provides a flexible and powerful data acquisition capability to record sensory evoked potentials (auditory, visual, and somatosensory), event related slow potentials (CNV, P300), and behavioral measures. PEARL II was mounted in a mobile laboratory to facilitate field testing. Data obtained in pediatric lead studies are provided for illustration. GRA

N86-29495*# Stanford Univ., Calif. Div. of Cardiology.
EFFECTS OF SIMULATED WEIGHTLESSNESS ON REGIONAL BLOOD FLOW SPECIFICALLY DURING CARDIOVASCULAR STRESS Final Report
D. C. HARRISON 1986 15 p
(Contract NCC2-126)
(NASA-CR-177117; NAS 1.26:177117) Avail: NTIS HC A02/MF A01 CSCL 06S

Significant changes in the cardiovasular system of humans and animals have been observed following exposure to prolonged periods of weightlessness during space flight. Although adaption to weightlessness is relatively uncomplicated, marked changes in cardiovascular deconditioning become evident upon return to normal gravity, including orthostatic hypotension and tachycardia. Some evidence that myocardial degeneration occurs has been demonstrated in animals who have been immobilized for two months. Also, evidence of possible loss of myocardial mass following manned space flight has been obtained by means of echocardiographic studies. These findings have serious implications in light of the increasing frequency and duration of Space Shuttle missions and the prospect of extended space station missions in the future. A number of both military and civilian investigators, including middle-aged scientists, will probably encounter prolonged periods of weightlessness. It has been imperative, therefore, to determine the effects of prolonged weightlessness on cardiovascular deconditioning and whether such effects are cumulative or reversible. The research project conducted under NASA Cooperative Agreement NCC 2-126 was undertaken to determine the effects of prolonged simulated weightlessness on regional blood flow. Research results are reported in the three appended publications. Author

N86-29496*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SKELETAL RESPONSE TO SHORT-TERM WEIGHTLESSNESS Final Technical Report
T. J. WRONSKI and E. R. MOREY-HOLTON 1986 16 p
(Contract NCC2-337)
(NASA-TM-88778; NAS 1.15:88778) Avail: NTIS HC A02/MF A01 CSCL 06S

Male Sprague Dawley rats were placed in orbit for 7 days aboard the space shuttle. Bone histomorphometry was performed in the long bones and lumbar vertebrae of flight rats and compared to data derived from ground based control rats. Trabecular bone mass was not altered during the first week of weightlessness. Strong trends were observed in flight rats for decreased periosteal bone formation in the tibial diaphysis, reduced osteoblast size in the proximal tibia, and decreased osteoblast surface and number in the lumbar vertebra. Histologic indices of bone resorption was relatively normal in flight rats. The results indicate that 7 day of weightlessness are not of sufficient duration to induce histologicaly

detectable loss of trabecular bone in rats. However, cortical and trabecular bone formation appear to be diminished during the first week of space flight. Author

N86-29497*# California Univ., San Diego.
CARDIAC RESERVE DURING WEIGHTLESSNESS SIMULATION AND SHUTTLE FLIGHT Final Report, 15 Oct. 1984 - 14 Oct. 1985
A. L. GOLDBERGER Oct. 1985 32 p
(Contract NCC2-335)
(NASA-CR-177085; NAS 1.26:177085; LR-7552) Avail: NTIS HC A03/MF A01 CSCL 06S

Bedrest deconditioning is suspected to reduce cardiac function. However, quantitation of subtle decreases in cardiac reserve may be difficult. Normal subjects show considerable variability in heart rate response, reflected by a relatively broadband interbeat interval power spectrum. We hypothesized that the deconditioning effects of bedrest would induce narrowing of this spectrum, reflecting a reduction in the autonomically-modulated variability in heart rate. Ten aerobically conditioned men (average 35-50 years) underwent orthostatic tolerance testing with lower body negative pressure pre-bedrest and after 10 days of bedrest, while on placebo and after intravenous atropine. Spectra were derived by Fourier analysis of 128 interbeat interval data sets from subjects with sufficient numbers of beats during matched periods of the protocol. Data suggest that atropine unmasks the deconditioning effect of bedrest in athletic men, evidenced by a reduction in interbeat interval spectral power compared with placebo. Spectral analysis offers a new means of quantitating the effects of bedrest deconditioning and autonomic perturbations on cardiac dynamics. Author

N86-29498*# Vanderbilt Univ., Nashville, Tenn. School of Medicine.
WEIGHTLESSNESS SIMULATION: PHYSIOLOGICAL CHANGES IN FAST AND SLOW MUSCLE Final Technical Report, 1 Jun. 1984 - 31 May 1985
W. D. DETTBARN 31 May 1985 22 p
(Contract NAG2-301)
(NASA-CR-176945; NAS 1.26:176945) Avail: NTIS HC A02/MF A01 CSCL 06P

The role of the intact motor system in the maintenance of normal skeletal muscle structure and function were examined. Using a multidisciplinary approach, changes in slow and fast muscle were examined in response to three experimental paradigms: motor nerve denervation, spinal cord section, and nonsurgically induced disuse (or hypokinesia). The effects of use and disuse on the free radical scavenging system in relation to the mitochondrial oxidative metabolism in fast twitch and slow twitch muscle were also investigated. The effects of denervation and reinnervation on cuprozinc superoxide dismutase, manganosuperoxide dismutase, glutathione peroxidase, fumarase, cytochrome c oxidase, and GSH-peroxidase were studied. Changes in biochemical, histochemical, and physiological characteristics of the predominately slow (type 1) soleus and predominately fast (type 2) extensor digitorum longus are correlated with electromyogram assessment of muscle activation. B.G.

N86-29499# Sea-Space Research Co., Inc., Harvey, La.
EVALUATION OF THE USE OF HYDROGEN-OXYGEN AS A BREATHING GAS IN DEEP-SEA DIVING
P. EDEL 1986 31 p
(Contract N00014-85-C-0592)
(AD-A165797) Avail: NTIS HC A03/MF A01 CSCL 06K

An attempt is made to define the state-of-the-art for the use of Hydrogen-Oxygen mixtures for diving operations. Information relative to past and current research efforts in the U.S. and foreign countries is compiled. This information is utilized to identify possible areas of application with this mixture in appropriate conditions and in areas in which hydrogen-oxygen mixtures could offer physiological advantages not possible with currently used breathing mixtures. Further research is needed prior to operational use of this mixture, and recommendations for current and future research and development needs are included in this report. Hydrogen-oxygen mixtures have shown sufficient advantage to warrant further research. Present experience indicates that H2-02 mixtures offer some potential advantages over present helium-oxygen bounce diving applications for operations where on-site gas storage space is limited and/or resupply of breathing gas mixtures are a potential problem. Present experience indicates that H2-He-02 mixtures offer some potential advantages over present helium-oxygen saturation diving operations at depths where increased diver performance and reduction of breathing resistance is an important factor. Hydrogen narcosis effects and decompression requirements are the major primary physiological research areas requiring investigation prior to possible applications of such mixtures. GRA

N86-29500# Research Inst. of National Defence, Umea (Sweden). Dept. 4.
METHOD FOR THE DETERMINATION OF RESPIRATORY WORK IN PROTECTIVE MASKS
I. BERGLUND and K. NYREN Jun. 1985 27 p In SWEDISH; ENGLISH summary
(FOA-C-40213-C2; ISSN-0347-2124; ESA-86-97042) Avail: NTIS HC A03/MF A01; Research Inst. of National Defence, Stockholm, Sweden KR 50

A method for estimating respiratory work by measuring flow and pressure in a protective mask on a dummy head, during inhalation and exhalation, with a respiratory pump is described. Data acquisition, evaluation, and graphical presentation for a respiratory cycle are performed with a laboratory computer. Malfunction of the inlet valve may lead to leakage so that expired air wrongly passes through the filter. Actually the user of the mask would compensate for this by increasing the respired volume, thus increasing the respiratory work. In the described method this leakage indicates, on the contrary, lower respiratory workload. ESA

N86-29501# Chicago Univ., Ill. Dept. of Radiology.
MTF'S AND WIENER SPECTRA OF RADIOGRAPHIC SCREEN-FILM SYSTEMS. VOLUME 2: (INCLUDING SPEEDS OF SCREENS, FILMS AND SCREEN-FILM SYSTEMS)
K. DOI, Y. KODERA, L. N. LOO, H. P. CHAN, and Y. HIGASHIDA Mar. 1986 110 p Sponsored by FDA
(Contract PHS-223-78-6003; PHS-223-81-6014)
(PB86-184934; HHS/PUB/FDA-86-8257-VOL-2; FDA/CDRH-86/103-VOL-2) Avail: NTIS HC A06/MF A01 CSCL 06E

Volumes I and II of the report constitute a consistent, quantitative evaluation of the physical imaging performance of most currently available radiographic screens and films. Volume I (HHS Publication FDA 82-8187, April 1982) reported measurements of MTF's and Wiener spectra of a large number of screen-film systems and described the methodology. Volume II reports measurement (using the same methodology) of MTF's and Wiener spectra of additional systems. Volume II also reports absolute speeds (determined according to ANSI Standard PH 2.43-1982) for selected systems and relative speeds for a large group of screens and films; methodology for these measurements is described in detail. GRA

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

A86-40476
SIMULATORS; PROCEEDINGS OF THE CONFERENCE, NORFOLK, VA, MARCH 3-8, 1985
J. S. GARDENIER, ED. (U.S. Coast Guard, Washington, DC) La Jolla, CA, Society for Computer Simulation (Simulation Series. Volume 16, No. 1, 1985), 1985, 200 p. For individual items see A86-40477 to A86-40486.

Flight simulator upgrades and modifications are considered along with relationships among aircrew performance measures for evaluating flight simulator training effectiveness, representation of ground reaction forces as a function of the position of the center of pressure during gait, dynamic process simulators for steel rolling plants, and the simulation of ferrofluidic seals for optimum design. Attention is also given to enhancement options for improving the effectiveness of training with nuclear power plant simulators, human performance simulation, the integration of surface warfare simulation with instructional training techology, training simulator evaluation, and numerical simulation of two-phase flow in pipe networks. Other topics explored are related to the use of simulators for the training and evaluation of nuclear plant personnel, the use of standard computer terminals for the instructor console on a real-time nuclear reactor training simulator, and the importance of color displays in visual flight simulation. G.R.

A86-40479
RELATIONSHIPS AMONG AIRCREW PERFORMANCE MEASURES FOR EVALUATING FLIGHT SIMULATOR TRAINING EFFECTIVENESS
R. T. NULLMEYER (USAF, Human Resources Laboratory, Williams AFB, AZ) and M. R. ROCKWAY (Dayton, University, Williams AFB, AZ) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-8, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 13-17.

Transfer of training from the C-130E Weapon System Trainer (WST) to C-130E aircraft was evaluated for approaches, landings, and engine-out go-arounds. Two groups of student copilots with no previous experience in the C-130 aircraft were used as subjects. One group (test) received training in the C-130 WST prior to transferring to the aircraft while the other group (control) did not. Overall student proficiency, amount of instructor assistance, and selected flight parameters were monitored during the performance of each task in the aircraft. Several variations of the above measures were analyzed to compare the inflight performance of the two groups. In general, the test group received significantly higher ratings of overall proficiency and required less instructor assistance in the aircraft than did the control group. The selected flight parameters, on the other hand, were insensitive to the differences between the two groups. The implications of these findings for understanding the nature of aircrew learning and the determination of flight simulator training effectiveness are discussed. Author

A86-40480
HUMAN PERFORMANCE SIMULATION - COMBINING THE DATA
V. J. GAWRON (Calspan Corp., Buffalo, NY) and J. POLITO (Sperry Corp., Sugarland, TX) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-8, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 61-65. refs
(Contract MDA903-81-C-AA06)

As part of a recent program to develop computer models of human performance and decision-making (Model of Operator Performance in Air Defense System, MOPADS), a method was developed to combine human performance data from multiple sources into a single measure of predicted task performance time or probability. In the case where multiple equations are relevent to the current state being simulated, the derived completion times or probabilities are combined in a weighted equation to produce a single derived probability. The weight for each calculated time or probability is the number of independent variables represented in the moderator equation from which that particular value was calculated. This approach is based on the law of diminishing returns which states that the inclusion of more predictor variables in a regression equation will increase the total amount of variance in the data accounted for by the equation; however, each new variable added will account for a lesser portion of the total variance than any of the variables that preceded it. Author

A86-40482
RESOLUTION AND SCENE DETAIL PERFORMANCE OF THE VISUAL SYSTEM IN FLIGHT SIMULATION
R. E. CLAPP (Boeing Military Aircraft Co., Wichita, KS) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-8, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 169-173. refs

Engineers and designers working in simulation are frequently unaware of many of the aspects of the physical processes of vision and usually completely unaware of the psychophysical processes connected with how the human vision perceives the simulated (or real) world. This paper considers the human visual parameters (resolution, detection levels of scene detail, luminosity effects, 'traps' of vision, various psychophysical processes, etc.), how these parameters interact with the presented visual simulation, and how the proper application of these parameters to the techniques of design or visual simulations could produce more acceptable systems. Author

A86-40484
IMPORTANCE OF COLOR DISPLAYS IN VISUAL FLIGHT SIMULATION
R. E. CLAPP (Boeing Military Aircraft Co., Wichita, KS) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-8, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 179-182. refs

The characteristics of color and the advantages of its use in displays are considered. Attention is given to the three dimensions of color, variation of hue discrimination with illuminance, optimum luminance for displaying color, variation in color discrimination, target detection as a function of resolution and as a function of contrast, a summary of color effects, the resolution of displays, and resolution requirements. It is concluded that despite the poorer detection level resolution of color display compared to black and white displays, color displays provide better recognition and identification of objects in the display. Color displays are more acceptable to observers due to a closer approach to real world conditions (more realism). It is pointed out that the major advantage of the use of color displays is related to an increase in the information levels of the display. G.R.

A86-40485
THE HUMAN DUAL VISUAL SYSTEMS - THEIR IMPORTANCE IN SIMULATION
R. E. CLAPP (Boeing Military Aircraft Co., Wichita, KS) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-8, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 183-187. refs

The human visual system possesses a capability of dual mode operation in sensing the visual environment. These modes of operation are given the names of 'Ambient Visual Mode', and 'Focal Visual Mode'. The ambient mode mediates the wide field of view scene organization and intersensory areas, while the focal mode supplies the detail structure. The operation of the dual modes and their interrelationship establish the visual world as perceived by the observer. This paper discusses the operation of each of the visual modes, their interrelationship, their importance of what we perceive, and how these factors may be employed in improving visual display systems. Author

A86-40571
THE PERSONALITY AND PHYSIQUE OF UNDERGRADUATE AVIATION MAJORS
I. C. ADAMS (University College of Arts, Science and Education, Manama, Bahrain) and W. BOLONCHUK (North Dakota, University, Grand Forks) International Journal of Aviation Safety (ISSN 0264-6803), vol. 3, Dec. 1985, p. 280-283. refs

The personality and physique of 31 male undergraduate aviation majors and 100 male nonaviation majors at the University of North Dakota, U.S., are evaluated. The Cattell sixteen personality factor questionnaire and the Heath-Carter somatotype method were utilized in this study. The data reveal that the aviation majors scored higher than nonaviation majors in ego strength, dominance, surgency, conscientiousness, venturesomeness, self-sentiment, experimenting, pathemia, and independence, and lower than nonmajors in tenseness. It is observed that both groups were basically mesomorphic with secondary endomorphy; however, the aviation majors were lower in mesomorphy and ectomorphy than nonmajors. I.F.

A86-41799
AIR FORCE USES COMPUTER LESSONS TO TRAIN INSTRUCTORS, FLIGHT CREWS
Aviation Week and Space Technology (ISSN 0005-2175), vol. 124, June 2, 1986, p. 54, 55, 57.

Two engineering research demonstrators are being used at Dyess Air Force Base to train instructors and operating crews of the B-1B bomber, over the course of 272 hrs of computer-aided instruction. Each real time, man-in-the-loop simulator encompasses all B-1B crew stations, which are those of pilot and copilot on the flight deck, and offensive systems officer and defensive systems officer in the aft position. To aid the learning process, colors of the simulator graphics are coordinated with those used in the instruction texts. O.C.

N86-28616# California Univ., Santa Barbara.
COMPONENTS OF SPATIAL ABILITY Final Report, Jun. 1981 - Sep. 1984
J. W. PELLEGRINO, D. L. ALDERTON, and J. W. REGIAN 24 Mar. 1986 68 p
(Contract N00014-81-C-0616; NR PROJ. RR0-4204)
(AD-A165694) Avail: NTIS HC A04/MF A01 CSCL 05J

The goal of this project was to identify information processing components of spatial ability. A summary paper is presented that reviews major psychometric analyses of spatial ability as they relate to theories of information processing. The primary emphasis in the review is of studies isolating individual differences in components of spatial information processing. Research is also reviewed on the acquisition of spatial processing skills. The final section considers implications of this line of research for issues of assessment, particularly as it relates to modern technologies for testing. GRA

N86-28617# Wisconsin Univ., Madison. Center for Education Research.
INEXPERT CALIBRATION OF COMPREHENSION Technical Report, Sep. - Dec. 1985
A. M. GLENBERG and W. EPSTEIN 1 Mar. 1986 48 p
(Contract N00014-85-K-0644; NR PROJ. RR0-4206)
(AD-A166701; WCER-86-3) Avail: NTIS HC A03/MF A01 CSCL 05J

Students with a wide range of coursework in physics or music theory read expositions in both domains. After reading, for each text students provided a judgment of confidence in ability to verify inferences based the central principle of the text. The primary dependent variable was calibration of comprehension, the degree of association between confidence and performance in the inference test. Two results of most interest were expertise in a domain was inversely related to calibration and subjects were well-calibrated across domains. Both of these results can be accommodated by a self-classification strategy: Confidence judgments are based on self-classification as expert or non-expert in the domain of the text, rather than an assessment of the degree to which the text was comprehended. Because self-classifications are not well differentiated within a domain, application of the strategy by experts produces poor calibration within a domain. Nonetheless, because self-classification is generally consistent with performance across domains, application of the strategy produces calibration across domains. GRA

N86-29502*# Massachusetts Inst. of Tech., Cambridge. Man-Machine Systems Lab.
EFFECT OF TIME SPAN AND TASK LOAD ON PILOT MENTAL WORKLOAD
S. L. BERG and T. B. SHERIDAN Mar. 1985 150 p
(Contract NAG2-227)
(NASA-CR-177099; NAS 1.26:177099) Avail: NTIS HC A07/MF A01 CSCL 05H

Two sets of experiments were run to examine how the mental workload of a pilot might be measured. The effects of continuous manual control activity versus discrete assigned mental tasks (including the length of time between receiving an assignment and executing it) were examined. The first experiment evaluated the strengths and weaknesses of measuring mental workload with an objective perforamance (altitude deviations) and five subjective ratings (activity level, complexity, difficulty, stress, and workload). The second set of experiments built upon the first set by increasing workload intensities and adding another performance measure: airspeed deviation. The results are discussed for both low and high experience pilots. B.G.

N86-29503*# California State Univ., Hayward. Dept. of Psychology.
HESITATIONS IN CONTINUOUS TRACKING INDUCED BY A CONCURRENT DISCRETE TASK
S. T. KLAPP, P. A. KELLY, and A. NETICK 1985 40 p
(Contract NCC2-223)
(NASA-CR-177019; NAS 1.26:177019) Avail: NTIS HC A03/MF A01 CSCL 05I

Subjects performed a continuous visually-guided pursuit tracking task with the right hand. From time to time (intervals averaging 30 sec) an auditory tone appeared signaling the subjects to perform a discrete response with the left hand. The presence of this tone was frequently associated with a hesitation in right-hand tracking which lasted 1/3 sec or longer. The rate of occurrence of these hesitations was about the same when the left-hand response involved a choice between competing responses as when the left hand responded in a predetermined direction. Hesitations occurred for three different mechanical tracking manipulanda using different controlling muscles, and appeared to be due to freezing rather than to relaxation of muscular action. The rate of occurrence of hesitations declined with practice, and this improvement in right-hand performance was accompanied by an improvement in performance of the concurrent left-hand response. The presence of hesitations, and their reduction with practice, can be interpreted within several viewpoints. Author

N86-29504*# California Univ., Los Angeles. School of Engineering and Applied Science.
MODEL-BASED APPROACHES FOR PARTITIONING SUBJECTIVE WORKLOAD ASSESSMENTS Final Technical Report
J. LYMAN Feb. 1986 19 p Presented at the Annual Conference of Manual Control, Jun. 1986
(Contract NAG2-216)
(NASA-CR-177030; NAS 1.26:177030) Avail: NTIS HC A02/MF A01 CSCL 05I

Modified Petri nets (MPNs) were investigated as a workload modeling tool. The MPN model was screened for general sensitivity to changes in workloads. A canonical correlation was conducted between the MPN parameters and the workload ratings. The results of the canonical correlation indicated that the MPN model of the experimental task represented the task components that influenced the subjective workload. B.G.

N86-29505*# Ohio State Univ., Columbus. Dept. of Aviation.
THE EFFECTS OF EXPRESSIVITY AND FLIGHT TASK ON COCKPIT COMMUNICATION AND RESOURCE MANAGEMENT Final Report, 1 Aug. 1982 - 31 Aug. 1985
R. S. JENSEN Jun. 1986 95 p
(Contract NCC2-206; RF PROJ. 76327/714794)
(NASA-CR-177036; NAS 1.26:177036; APL-86-1) Avail: NTIS HC A05/MF A01 CSCL 05I

The results of an investigation to develop a methodology for evaluating crew communication behavior on the flight deck and a flight simulator experiment to test the effects of crew member expressivity, as measured by the Personal Attributes Questionnarie, and flight task on crew communication and flight performance are discussed. A methodology for coding and assessing flight crew communication behavior as well as a model for predicting that behavior is advanced. Although not enough crews were found to provide valid statistical tests, the results of the study tend to indicate that crews in which the captain has high expressivity perform better than those whose captain is low in expressivity. There appears to be a strong interaction between captains and first officers along the level of command dimension of communication. The PAQ appears to identify those pilots who offer disagreements and inititate new subjects for discussion. Author

N86-29506# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
RAPID MEASUREMENT OF INDIVIDUAL STRESS REACTION LEVEL: DEVELOPMENT OF THE EMOTIONAL REACTION QUESTIONNAIRE (ESRQ)
G. LARSSON Jan. 1986 33 p In SWEDISH; ENGLISH summary
(FOA-C-50034-H3; ISSN-0347-7665; ESA-86-97044) Avail: NTIS HC A03/MF A01

A questionnaire which estimates the magnitude of the stress reaction of an individual in a given situation in less than a minute is described. Psychological coping potential can also be predicted. Derivation of the questionnaire from coping theory is outlined. The process of instrument development is described and instructions for usage and interpretation of the questionnaire are given. Normative data as well as assessments of reliability and validity are presented. ESA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-40483
THE IMPORTANCE OF STEREOSCOPIC IMAGERY IN FLIGHT SIMULATION
R. CLAPP (Boeing Military Airplane Co., Wichita, KS) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-6, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 174-178. refs

It is pointed out that one of the main problems in vision is the geometrical interpretation which an observer derives from the visual scene. The present paper is concerned with the various aspects of stereoscopic vision, taking into account applications to visual displays, and methods for producing stereoscopic images. Attention is given to problems of distance judgment, binocular vision, stereoscopic systems, and binocular vision in simulation. Judgment requirements related to aerial refueling are considered along with formation flight training, and low level flight training. Pilot and aircrew judgment of size and distance is found to be critical in many training scenarios, and stereoscopic display is particularly required for final training in initial training tasks and for continuation training. G.R.

A86-40486
VISUAL DISPLAY REQUIREMENTS FOR BOOM OPERATOR TRAINING IN AERIAL REFUELING
R. E. CLAPP (Boeing Military Aircraft Co., Wichita, KS) IN: Simulators; Proceedings of the Conference, Norfolk, VA, March 3-6, 1985 . La Jolla, CA, Society for Computer Simulation, 1985, p. 188-192. refs

This paper discusses the performance parameters of the visual system display for boom operator training in aerial refueling including field of view, resolution, brightness, contrast, color, stereopsis, image detail and display rates. These parameters are based upon extensive experience and study in aerial refueling operations and simulation. Such display systems have application in other simulation scenarios involving manipulation operations. Author

A86-40508
RECENT ADVANCES IN TELEOPERATION - IMPLICATIONS FOR THE SPACE STATION
M. M. CLARKE (Rockwell International Corp., Downey, CA) IN: Space tech; Proceedings of the Conference and Exposition, Anaheim, CA, September 23-25, 1985 . Dearborn, MI, Society of Manufacturing Engineers, 1985, p. 4-1 to 4-10. refs

The paper describes recent advances in teleoperation in nonaerospace hostile environments and discusses their applicability to space-related teleoperation. For example, remotely maintainable manipulators can increase system availability while continuing to exclude the crew from the hostile environment. Force reflection and supervisory control can reduce the operator's fatigue and workload. The Universal Master Controller can increase the system control flexibility. Author

A86-40521
EVA SUIT GLOVE DESIGN
B. PEACOCK, R. SHAMBAUGH, F. STRITZ (Oklahoma, University, Norman), and J. HORDINSKY (FAA, Oklahoma City, OK) IN: Space tech; Proceedings of the Conference and Exposition, Anaheim, CA, September 23-25, 1985 . Dearborn, MI, Society of Manufacturing Engineers, 1985, p. 8-14 to 8-25. refs

Traditional testing of gloves has been a subjective study by experienced designers and astronauts. An objective series of standardized tests were developed to test dexterity, strength, and tactility in a single-handed vacuum chamber. A finite element analysis simulates the effects of restraints and pleats at various glove pressures. For the finger, the incorporation of a lateral restraint and pleats on both the front and back of the joint led to near zero resistance to bending. A total glove model also was developed. A process was developed which used a computer to control the movement of an air jet to lay down continuous fiber on a fine mesh which overlaid a suction mechanism. With this technique, gloves can be quickly and economically produced with infinite selectibility of size, construction, and materials. Author

A86-40522* Worcester Polytechnic Inst., Mass.
THE WPI SPACE GLOVE DESIGN PROJECT
W. W. DURGIN, A. H. HOFFMAN, H. K. AULT, and F. C. LUTZ (Worcester Polytechnic Institute, MA) IN: Space tech; Proceedings of the Conference and Exposition, Anaheim, CA, September 23-25, 1985 . Dearborn, MI, Society of Manufacturing Engineers, 1985, p. 8-26 to 8-41. NASA-supported research.

Worcester Polytechnic Institute (WPI) was one of four colleges and universities awarded NASA grants for student design and development of an improved glove for space suits. This paper traces the design, development and testing of the WPI prototype glove. Test results showed that the glove did not significantly limit hand and finger motion when pressurized at 8 psi, except in the spherical grip mode. This project demonstrated that problems originating from space technology provide excellent vehicles for student learning and can generate creative solutions. Author

A86-40585#
ADVANCED EVA OPERATION ON-ORBIT TASKS AND SERVICES
F. J. ABELES and R. H. SCHAEFER (Grumman Corp., Bethpage, NY) IN: Space Systems Technology Conference, San Diego, CA, June 9-12, 1986, Technical Papers . New York, American Institute of Aeronautics and Astronautics, 1986, p. 60-68.
(AIAA PAPER 86-1175)

Methods for improving astronauts' productivity during extravehicular activity (EVA) are described. EVA operations involve construction, servicing, and maintenance of the Space Shuttle and servicing and maintenance of the Shuttle's payloads. EVA cycle tasks must be performed in the proper sequence and it is estimated that an astronaut can perform up to 6.5 hrs of EVA productive work during one EVA and a maximum of 19.5 hrs of EVA productive work per astronaut can be accomplished in a week. The utilization of dedicated work stations, a dedicated translation system, properly designed equipment, and job performance aids, such as the helmet mounted display (HMD), to increase EVA productive time is studied. The function and advantages of the HMD are examined. The need to consider the astronaut's comfort during performance of EVA tasks is discussed. I.F.

A86-41381
A DISCRETE CONTROL MODEL OF OPERATOR FUNCTION - A METHODOLOGY FOR INFORMATION DISPLAY DESIGN
C. M. MITCHELL (Georgia Institute of Technology, Atlanta) and R. A. MILLER (Ohio State University, Columbus) IEEE Transactions on Systems, Man, and Cybernetics (ISSN 0018-9472), vol. SMC-16, May-June 1986, p. 343-357. refs

Recent advances in computer technology and the changing rule of the human in complex systems require changes in design strategies for information displays. The use of discrete control models to represent the human operator's cognitive and decision making activities is described. The analytic procedures required to build a discrete control model show promise as a basis of a design methodology for the definition of an information display system for supervisory control tasks. The discrete control modeling procedures and their application for a simulated system is demonstrated. Author

N86-28291*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
REVERSE OSMOSIS WATER PURIFICATION SYSTEM
H. G. AHLSTROM, P. S. HAMES, and F. J. MENNINGER *In its* The Telecommunications and Data Acquisition Report 10 p 15 May 1986
Avail: NTIS HC A10/MF A01 CSCL 06K

A reverse osmosis water purification system, which uses a programmable controller (PC) as the control system, was designed and built to maintain the cleanliness and level of water for various systems of a 64-m antenna. The installation operates with other equipment of the antenna at the Goldstone Deep Space Communication Complex. The reverse osmosis system was designed to be fully automatic; with the PC, many complex sequential and timed logic networks were easily implemented and are modified. The PC monitors water levels, pressures, flows, control panel requests, and set points on analog meters; with this information various processes are initiated, monitored, modified, halted, or eliminated as required by the equipment being supplied pure water. Author

N86-28618* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
TORSO SIZING RING CONSTRUCTION FOR HARD SPACE SUIT Patent
H. C. VYKUKAL 10 Jun. 1986 9 p Filed 20 Dec. 1984 Supersedes N85-21987 (23 - 12, p 1910)
(NASA-CASE-ARC-11616-1; US-PATENT-4,593,415; US-PATENT-APPL-SN-684193; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-2-2.1R; US-PATENT-CLASS-128-202.11; US-PATENT-CLASS-414-1; US-PATENT-CLASS-414-5; US-PATENT-CLASS-414-7; US-PATENT-CLASS-414-8) Avail: US Patent and Trademark Office CSCL 06Q

A hard suit for use in space or diving applications having an adjustable length torso covering that will fit a large variety of wearers is described. The torso covering comprises an upper section and a lower section which interconnect so that the covering will fit wearers with short torsos. One or more sizing rings may be inserted between the upper and lower sections to accomodate larger torso sizes as required. Since access of the astronaut to the torso covering is preferably through an opening in the back of the upper section (which is closed off by the backpack), the rings slant upward-forward from the lower edge of the opening. The lower edge of the upper covering section has a coupler which slants upward-forward from the lower edge of the back opening. The lower torso section has a similarly slanted coupler which may interfit with the upper section coupler to accomodate the smallest torso size. One or more sizing rings may be inserted between the coupler sections of the upper and lower torso sections to accomodate larger torsos. Each ring has an upper coupler which may interfit with the upper section coupler and a lower coupler which may interfit with the lower section coupler. NASA

N86-28619* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ELBOW AND KNEE JOINT FOR HARD SPACE SUITS Patent
H. C. VYKUKAL 8 Jul. 1986 13 p Filed 30 Dec. 1984 Supersedes N85-20666 (23 - 11, p 1697)
(NASA-CASE-ARC-11610-1; US-PATENT-4,598,427; US-PATENT-APPL-SN-684190; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-2-2.1R; US-PATENT-CLASS-285-168; US-PATENT-CLASS-138-120) Avail: US Patent and Trademark Office CSCL 06Q

An elbow or knee joint for a hard space suit or similar usage is formed of three serially connected rigid sections which have truncated spherical configurations. The ends of each section form solid geometric angles, and the sections are interconnected by hermetically sealed ball bearings. The outer two sections are fixed together for rotation in a direction opposite to rotation of the center section. A preferred means to make the outer sections track each other in rotation comprises a rotatable continuous bead chain which engages sockets circumferentially spaced on the facing sides of the outer races of the bearings. The joint has a single pivot point and the bearing axes are always contained in a single plane for any articulation of the joint. Thus flexure of the joint simulates the coplanar flexure of the knee or elbow and is not susceptible to lockup. NASA

N86-28620* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
SHOULDER AND HIP JOINT FOR HARD SPACE SUITS Patent
H. C. VYKUKAL 17 Jun. 1986 11 p Filed 20 Dec. 1984 Supersedes N85-21986 (23 - 12, p 1910)
(NASA-CASE-ARC-11543-1; US-PATENT-4,594,734; US-PATENT-APPL-SN-684192; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-414-7; US-PATENT-CLASS-285-168; US-PATENT-CLASS-138-120) Avail: US Patent and Trademark Office CSCL 06Q

Shoulder and hip joints for hard space suits are disclosed which are comprised of three serially connected truncated spherical sections, the ends of which converge. Ball bearings between the sections permit relative rotation. The proximal end of the first section is connected to the torso covering by a ball bearing and the distal end of the outermost section is connected to the elbow

or thigh covering by a ball bearing. The sections are equi-angular and this alleviates lockup, the condition where the distal end of the joint leaves the plane in which the user is attempting to flex. The axes of rotation of the bearings and the bearing mid planes are arranged to intersect in a particular manner that provides the joint with a minimum envelope. In one embodiment, the races of the bearing between the innermost section and the second section is partially within the inner race of the bearing between the torso and the innermost spherical section further to reduce bulk.

NASA

N86-28621# Army Belvoir Research and Development Center, Fort Belvoir, Va.

DEVELOPMENT OF U.S. ARMY REVERSE OSMOSIS WATER PURIFICATION EQUIPMENT Final Report, 1950 - 1985

D. C. LINDSTEN Jan. 1986 76 p

(AD-A165667; BRDC-2418) Avail: NTIS HC A05/MF A01 CSCL 13B

The United States Army has developed and field-tested a 600-gal/h Reverse Osmosis Water Purification Unit (ROWPU). In addition, it has procured a 150,000-gal/d ROWPU, and has under development a 3000-gal/h ROWPU. These units are capable of purifying raw water, seawater, brackish water, and water contaminated with nuclear, biological, and chemical (NBC) warfare agents.

GRA

N86-28622# Armed Forces Food Science Establishment, Scottsdale (Australia).

EVALUATION OF WATER STERILIZING TABLETS

G. F. THOMSON, K. W. JAMES, G. E. DRIVER, and A. T. HANCOCK Aug. 1985 22 p

(AD-A165806; AFFSE-2/85) Avail: NTIS HC A02/MF A01 CSCL 13B

Water sterilizing tablets were evaluated for their efficiency in killing micro-organisms. The effect of inhibitors and palatability were investigated. The effect of long term use is discussed. The water sterilizing tablet recommended for disinfection of personal drinking water is the Potable Aqua tablet. The Afses is not recommended because of its need for a quiescent period. The Puritabs is not recommended because of its inability to achieve the required 99.9% kill in heavily contaminated water, especially at alkaline pH values. Fortified beverage powders, which are effective detasting agents, will inactivate the disinfecting agent if added before completion of the recommended contact period.

GRA

N86-28623# Lawrence Livermore National Lab., Calif.

SUIT PENETRATION STUDY: PRELIMINARY ANALYSIS OF FLOW ABOUT A CIRCULAR CYLINDER

R. C. MCCALLEN and S. B. SUTTON 27 Nov. 1985 28 p

(Contract W-7405-ENG-48)

(DE86-005760; UCID-20636) Avail: NTIS HC A03/MF A01

The flow of atomized droplets around a circular cylinder (representing a human torso) is modeled. Two different computer codes have been used to generate solutions for the flow field: a finite difference code and a vertex method code. The finite difference code, CONCHAS-SPRAY (C-S), handles unsteady, viscous, compressible flow. The second code, KPD3, simulates unsteady, high Reynolds number, incompressible separated flow with an inviscid outer flow. The specific flow problem considered is described, followed by the results of a literature search for experimental data.

DOE

N86-29507*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SHOULDER AND HIP JOINTS FOR HARD SPACE SUITS AND THE LIKE Patent

H. C. VYKUKAL 8 Jul. 1986 12 p Filed 20 Aug. 1984 Supersedes N84-33021 (22 - 22, p 3633)

(NASA-CASE-ARC-11534-1; US-PATENT-4,598,428; US-PATENT-APPL-SN-642602; US-PATENT-CLASS-2-2.1A; US-PATENT-CLASS-285-168; US-PATENT-CLASS-285-184; US-PATENT-CLASS-285-227; US-PATENT-CLASS-138-120; US-PATENT-403-164) Avail: US Patent and Trademark Office CSCL 06Q

For use in hard space suits and the like, a joint between the torso covering and the upper arm covering (i.e., shoulder) or between the torso covering and upper leg covering (i.e., hip) is disclosed. Each joint has an outer covering and a inner covering. The outer covering has plural perferably truncated toroidal sections decreasing in size proceeding outwardly. In one embodiment at each joint there are two bearings, the first larger than the second. The outer race of the larger bearing is attached to the outer edge of the smaller end of each section and the inner race of the larger bearing is attached to the end wall. The inner race of the smaller bearing is attached to the end wall. The outer race of the smaller bearing is attached to the larger end of the next section. Each bearing hask appropriate seals. Between each section is a rubber ring for the comfort of the wearer. Such rubber rings have radial flanges attached to the inner races of two adjacent bearings. Matching semicircular grooves are formed in the abutting overlapping surfaces. Bellows-like inner walls are also provided for each section fixed at one end to an inner cylindrical flange and, at the opposite end, to an end wall. Each outer section may rotate 360 deg relative to the next outer section, whereas the bellows sections do not rotate, but rather expand or contract locally as the rigid sections rotate relative to each other.

NASA

N86-29508*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.

PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Report, Mar. - Aug. 1984

W. B. ROUSE, J. M. HAMMER, N. M. MORRIS, A. E. KNAEUPER, E. N. BROWN, C. M. LEWIS, and W. C. YOON Aug. 1984 45 p

(Contract NAG2-123)

(NASA-CR-177002; NAS 1.26:177002) Avail: NTIS HC A03/MF A01 CSCL 05H

Two project areas were pursued: the intelligent cockpit and human problem solving. The first area involves an investigation of the use of advanced software engineering methods to aid aircraft crews in procedure selection and execution. The second area is focused on human problem solving in dynamic environments, particulary in terms of identification of rule-based models land alternative approaches to training and aiding. Progress in each area is discussed.

B.G.

N86-29509*# Massachusetts Inst. of Tech., Cambridge. Dept. of Nutrition and Food Science.

EFFECTS OF CONSUMING VARIOUS FOODS AND NUTRIENTS ON OBJECTIVE AND SUBJECTIVE ASPECTS OF HUMAN PERFORMANCE AND BEHAVIOR Final Report, 1 Sep. 1983 - 31 Aug. 1984

R. J. WURTMAN and H. R. LIEBERMAN 31 Aug. 1984 10 p

(Contract NAG2-132)

(NASA-CR-177003; NAS 1.26:177003) Avail: NTIS HC A02/MF A01 CSCL 06H

A variety of behavioral tests were established and studies performed on young healthy subjects who received tryptophan, tyrosine or placeboes and on young and old subjects receiving protein and carbohydrate meals. The behavioral effect of the homone melatonin on human circadian rhythms was examined. The results are discussed.

B.G.

N86-29510# Naval Ship Research and Development Center, Bethesda, Md. Computation Mathematics and Logistics Dept.
THE SCIENTIFIC/ENGINEERING WORKSTATION EXPERIMENT: PRELIMINARY RESULTS, CONCLUSIONS AND RECOMMENDATIONS Progress Report, Apr. - Aug. 1984
R. T. VANESELTINE and M. B. MARQUARDT Dec. 1985 35 p (AD-A163059; DTNSRDC/CMLD-85/05) Avail: NTIS HC A03/MF A01 CSCL 05I

A Scientific/Engineering Workstation Experiment is being conducted to determine the characteristics of workstations which would significantly improve the productivity of scientists and engineers in the Naval Laboratories. This report discusses the evaluation methodology and results. Furthermore, the report presents preliminary comments and recommendations for scientific/engineering workstation specifications. The initial results of the experiment are based on the time interval from April to August, 1984. Four major preliminary conclusions were reached. First, workstations can be effectively used for real projects. Second, the individual scientists or engineer's working environment plays an important role in the utilization of a workstation. Third, certain features and capabilities were found to be used by scientists and engineers on certain features and capabilities were found to be used by scientists and engineers on almost all workstations. Finally, workstation specifications should be primarily based on performance requirements that insure the actual needs of scientists and engineers are met. GRA

N86-29511# Research Inst. of National Defence, Stockholm (Sweden). Dept. 5.
ANTHROPOMETRY RESEARCH PROGRAM
A. AVEN, S. DAHLMAN, and L. SPERLING Dec. 1985 51 p In SWEDISH; ENGLISH summary Sponsored by Swedish Work Environment Fund
(FOA-C-50032-H2; ISSN-0347-7665; ESA-86-97043) Avail: NTIS HC A04/MF A01

Swedish anthropometry investigations; collecting data on stature and body weight of people in Sweden; methods for comparing the body dimensions of different groups of people; and the use of anthropometry when designing equipment and enviroments were discussed. ESA

N86-29512# Centre d'Essais en Vol, Istres (France). Lab. de Medecine Aerospatiale.
THE CHOICE OF SEAT BACK ANGLE TO IMPROVE ACCELERATION TOLERANCE
J. M. CLERE, H. VIEILLEFOND, and J. L. POIRIER Oct. 1985 51 p
(Contract DRET-82-1131)
(CEV-70-209; ESA-86-97195) Avail: NTIS HC A04/MF A01

The optimization of pilot seat back angle at accelerations of 7.8 to 9 g was studied using centrifugal simulation facilities. The physiological parameters such as heart rate, blood pressure, and visual field were measured at seat back angles from 30 to 60 deg. It is shown that the seat back angle of 60 deg eliminates visual problems at 9 g and protects against blood circulation problems. Angles of 30 deg produce clear intolerance symptoms. ESA

N86-29513*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SPACE TELEOPERATION RESEARCH. AMERICAN NUCLEAR SOCIETY EXECUTIVE CONFERENCE: REMOTE OPERATIONS AND ROBOTICS IN THE NUCLEAR INDUSTRY; REMOTE MAINTENANCE IN OTHER HOSTILE ENVIRONMENTS
A. J. MEINTEL, JR. and R. W. WILL 1985 51 p Presented at the Executive Conference on Remote Operations and Robotics in the Nuclear Industry, Pine Mountain, Ga., 21 Apr. 1985
(NASA-TM-89234; NAS 1.15:89234; DE85-902186; CONF-850425-5) Avail: NTIS HC A04/MF A01 CSCL 05H

This presentation consists of four sections. The first section is a brief introduction to the NASA Space Program. The second portion summarized the results of a congressionally mandated study of automation and robotics for space station. The third portion presents a number of concepts for space teleoperator systems. The remainder of the presentation describes Langley Research Center's teleoperator/robotic research to support remote space operations. DOE

55

PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

N86-28624*# National Aeronautics and Space Administration, Washington, D.C.
MODIFICATION OF CYTOGENETIC AND PHYSIOLOGICAL EFFECTS OF SPACE FLIGHT FACTORS BY BIOLOGICALLY ACTIVE COMPOUNDS
A. A. ALIYEV, E. R. MEKHTI-ZADE, A. L. MASHINSKIY, and U. K. ALEKPEROV Jul. 1986 14 p Transl. into ENGLISH from Zhurnal Obshchey Biologii (USSR), v. 47, no. 2, Mar. - Apr. 1986 p 246-251 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASW-4004)
(NASA-TM-87987; NAS 1.15:87987) Avail: NTIS HC A02/MF A01 CSCL 06C

Physiological and cytogenetic changes in the Welsh onion plants induced by a short (82 days) and long term (522 days) space flight are expressed in decrease of seed germination, inhibition of stem growth, depression of cell division in root meristem, and increase in the number of structural chromosome rearrangements. The treatment of such plants with solutions of a-tocopherol, auxin, and kinetin decreased the level of chromosome aberrations to the control one and normalized cell divisions and growth partly or completely. Author

N86-28625*# National Aeronautics and Space Administration, Washington, D.C.
MONKEYS AS A SOURCE OF VIRAL DISEASES IN MAN
E. R. PILLE May 1986 14 p Transl. into ENGLISH from Voprosy Virusologii (USSR), v. 30, issue 2, Mar. - Apr. 1985 p 138-144 Transl. by Scientific Translation Service, Santa Barbara, Calif.
(Contract NASW-4004)
(NASA-TM-78017; NAS 1.15:78017) Avail: NTIS HC A02/MF A01 CSCL 06C

Under institutional scientific-research conditions, during contact with monkeys or their tissues, there is a danger of infection of the associates by simian viruses which are pathogenic to man. Presented in this paper is information on these stimulants. Author

N86-28626# Bundesministerium fuer Forschung und Technologie, Bonn (West Germany).
APPLIED BIOLOGY AND BIOTECHNOLOGY, THE PROGRAM OF THE FEDERAL GOVERNMENT, 1985-1988 [ANGEWANDTE BIOLOGIE UND BIOTECHNOLOGIE PROGRAMM DER BUNDESREGIERUNG 1985-1988]
Oct. 1985 82 p In GERMAN Original contains color illustrations
(ESA-86-96938) Avail: NTIS HC A05/MF A01

The program of the German Federal Government in the fields of applied biology is outlined. The measures taken by the government to intensify biotechnology basic research, and to provide research and economic conditions for an improved application of biotechnology are discussed. International cooperation in the domain is presented. The financial planning of the government for the stimulation of research in the fields of applied biology and biotechnology is presented. ESA

N86-28868# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Flugmedizin.

EXOBIOLOGICAL ASPECTS IN VIEW OF TITAN

G. HORNECK *In* ESA The Atmospheres of Saturn and Titan p 157-159 Dec. 1985

Avail: NTIS HC A14/MF A01

Contributions of Cassini mission data on Titan's atmosphere to exobiology are discussed. Cassini can study the nature, abundance and degree of complexity of organic molecules including the occurrence of chirality in the clouds, on the surface of Titan, or submerged in its ocean; the transient stages and the mechanisms of organic molecule formation; and the similarities of organic compounds and of their formation processes from different cosmic sources. ESA

N86-28871# Centre National de la Recherche Scientifique, Orleans (France). Centre de Biophysique Moleculaire.

SEARCH FOR CHIRAL MOLECULES AND OPTICAL ACTIVITY IN EXTRATERRESTRIAL SYSTEMS. THE CASSINI MISSION OPPORTUNITY

A. BRACK and G. SPACH (Rouen Univ. France) *In* ESA The Atmospheres of Saturn and Titan p 189-191 Dec. 1985

Avail: NTIS HC A14/MF A01

The genesis of homochiral systems and the conditions which dictate the choice of a given set of enantiomers rather than the antipode are discussed. Examination of extraterrestrial organic molecules may give clues if life based on carbon chemistry is sought. Where life is expected to exist (Mars), the detection of optical activity may be a good indication of its presence. The situation is different on Titan which is still in its phase of chemical evolution. The most simple possible derivatives devoid of oxygen atoms are listed. Search for optical activity on Titan raises difficult technical problems which, once solved, may be helpful for further exploration of other planets. ESA

N86-29514# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Flugmedizin.

PROCEEDINGS AND PROGRAM DRAFT IN GRAVITATIONAL BIOLOGY IN THE FEDERAL REPUBLIC OF GERMANY

Oct. 1985 194 p In GERMAN; ENGLISH summary Conference held in Cologne, West Germany, 14-15 Jun. 1985 Report will also be announced as translation (ESA-TT-988)

(DFVLR-MITT-85-16; ISSN-0176-7739; ESA-86-96885) Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The effects of weightlessness on animal organisms to better understand effects on human body during space flights are discussed. Investigations on vertebrate physiology, reproduction, genetics, neurobiology, and behavioral and motion physiology are proposed.

ESA

N86-29515# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Bereich fuer Projekttraegerschaften.

THE ROLE OF THE DFVLR PROJECT MANAGEMENT LIFE SCIENCES IN THE SPACE PROGRAM OF THE FEDERAL REPUBLIC OF GERMANY

F. DAHL *In its* Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVLR-Mitt-85-16) p 9-20 Oct. 1985 In GERMAN; ENGLISH summary

Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The German space program in cooperation with ESA and NASA is focussed on Spacelab 1 mission, on Eureca mission, the Long Duration Exposure Facility, the International Microgravity Laboratory, Spacelab D2 mission, as well as on bioracks, European Radiation Assembly and Human Physiology Laboratory. Experiments are carried out in radiobiology, exobiology, physiology, botany, microbiology, rhythmic processes, and biotechnology. The DFVLR project management and the experiment/project selection procedure by scientific advisory committees are presented. ESA

N86-29516# Stuttgart Univ. (West Germany). Abt. Bioenergetik.

A THEORETICAL CONCEPT FOR STATE CHANGES AND SHAPE CHANGES IN WEIGHTLESSNESS

R. J. STRASSER *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVLR-Mitt-85-16) p 23-31 Oct. 1985 In GERMAN; ENGLISH summary

Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

A theoretical concept for state and shape changes in weightlessness based on thermodynamics principles for open systems is developed. The influence of light, temperature, pressure, and gravity on the shape and state of a biological system, and therefore on the phenotype with steady genome are studied. Experiments are carried out on leaves, chloroplasts, neurospores and mammalian cell spheroids. An experimental module for cellular biology was built for automatic optical and electrode measurements. The data are recorded, stored, and processed at a ground station. Experiments in space stations are recommended to study the influence of gravity and geomagnetism on the shape and the biochemical processes of a biological system and to obtain data on the phylogenesis of more complicated organisms. ESA

N86-29517# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Cologne (West Germany). Inst. fuer Flugmedizin.

SOME REMARKS ON GRAVITATIONAL BIOLOGY

W. BRIEGLEB *In its* Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVLR-Mitt-85-16) p 33-44 Oct. 1985 In GERMAN; ENGLISH summary

Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

A functional system including direct/primary, indirect/secondary and various indirect/tertiary interactions between an organism and gravity was developed to study the genetic and phylogenic consequences of gravity on animals living in water or on land. Gravity influences the gravity receptors leading to humoral or neuronal responses according to cell or proprioreceptor excitation. The immersed condition with no indirect gravity influence is compared with real weightlessness to analyze gravity direct influence on an isolated cell function or on a bunch of cells in egg ontogenesis and to analyze the effects of gravity on statocyst differentiation. In animals living on land, the antigravity structures and functions are influenced by gravity. The mutational effects of gravity leading to gene evolution through neuronal and functional morphological responses are presented. Hypergravity and weightlessness should be further studied. ESA

N86-29518# Konstanz Univ. (West Germany). Biologische Fakultaet.

INVESTIGATIONS OF PARAMECIUM CELLS ANALYZED UNDER MICROGRAVITY CONDITIONS

H. PLATTNER *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVLR-Mitt-85-16) p 47-52 Oct. 1985 In GERMAN; ENGLISH summary

Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Paramecium tetraurelia cells were studied using light microscopy, video recording, amino-ethyl dextran as redocking trigger agent and electronic microscopy to analyze exocytosis movements, redocking cycles on the cellular membrane and trichocyst building-up for 12 hr. The relationship between trichocyst ejection and motion behavior under microgravity conditions is studied using behavior mutants and secretion mutants to assess the negative or positive selection pressure of trichocyst presence or absence. ESA

N86-29519# Bonn Univ. (West Germany). Zoologisches Inst.
THE ORIGIN OF THE SPICULE SKELETON OF FRESH WATER SPONGES (SPONGILLIDES)
N. WEISSENFELS *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 53-56 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Young fresh water sponges cultivated in laboratory in constant temperate water and in ambient temperature were used to study the origin of the sponge spicule skeleton. The SiO2 spicules are formed in scleroblasts. Aged spicules leave the scleroblasts and are transported by transport cells to their functional location where they adhere to the base plate through spongin which ensures their stability. The life cycle of the spongillides throughout the seasons is described. The influence of gravity on the development of young sponges should be studied. ESA

N86-29520# Cologne Univ. (West Germany). Zoologisches Inst.
LIMB REGENERATION IN AMPHIBIANS, A SUITABLE MODEL FOR INVESTIGATIONS OF THE EFFECTS OF WEIGHTLESSNESS AS REGARDS EVOLUTION AND MODIFICATIONS
H. J. ANTON *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 63-68 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Limb regeneration in urodeles, amphibians which have experienced a phylogenetic evolution to overcome the effects of gravity, was studied to analyze the long term effects of weightlessness depending on environmental conditions and on gene activation. The study gives data on evolution processes and phylogenesis under weightlessness, on calcium exchange, and physiological regeneration of the skeleton as supporting and moving apparatus. ESA

N86-29521# Ruhr Univ., Bochum (West Germany). Fakultaet fuer Biologie.
INVESTIGATIONS OF THE REPRODUCTIVE PHYSIOLOGY OF THE RAINBOW TROUT (SALMO GAIRDNERI RICHARDSON)
V. BLUEM and R. SCHULZ *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 69-73 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Morphological and endocrinal investigations on the reproductive physiology of the rainbow trout of either sex were performed to study hypothalamic production of gonadotropin releasing hormone (GnRH) using histological and histometrical analysis, to demonstrate the presence of gonadotrop hormone receptors (GTH-receptors) in testes and ovaries based on radioimmunological quantification and using the immunofluorescent technique. An in vitro system for gonad tissues was developed to study steroid genesis in short-time cultures. The effects of puberty in rainbow trout on material exchange are studied. Ethiological studies were carried out to determine the influence of sexual and/or parental phases. The morphological control of gametogenesis in micro-g environment is recommended as well as in vivo and in vitro investigations of reproduction-dependent hormonal systems. ESA

N86-29522# Essen Univ. (West Germany). Abt. fuer Zoophysiologie.
CHANGES IN THE MORPHOLOGICAL AND MOLECULAR BIOLOGICAL PROCESSES DURING EARLY EMBRYO DEVELOPMENT IN AMPHIBIANS UNDER MICRO G CONDITIONS
H. GRUNZ *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 75-80 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The effects of micro-g conditions on vegetative polarity (absence of change) in aging oocytes over 2 months were studied to determine the role of gene regulatory factors and the changes in nucleus-cytoplasm interactions. Cell affinity and induction should be investigated under micro-g conditions to study the processes of reaggregation between ectoderm and endoderm and the changes in the standard structure so as to understand normal and pathological embryo development. ESA

N86-29523# Giessen Univ. (West Germany). Genetischen Inst.
XIPHOPHORUS: A SYSTEM TO RECOGNIZE RADIATION-INDUCED MUTATIONS AND TO STUDY THE EFFECTS OF ZERO-GRAVITY ENVIRONMENT ON EMBRYO DEVELOPMENT
C. R. SCHMIDT and F. ANDERS *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 81-85 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The reproduction physiology of Xiphophorus is described. Laboratory mutants constitute a system of 60 stable and genetically determined species. Resulting from their crossbreeding melanomas appear due to a disorded oncogene. The Xiphophorus system is studied to determine the oncogene characteristics, regulation and transmission. Studies on Xiphophorus under weightlessness are recommended: influence of 0-g environment on skeleton and skeletonmuscle structure; epigenetic and/or genetic effects of 0-g environment on embryogenesis in vivo and in vitro; and the effects of the combined action of cosmic radiation and weightlessness on embryos, sub-adult and adult animals of the mutation-sensitive Xiphophurus test species to investigate mutagenesis and teratogenesis. ESA

N86-29524# Luebeck Univ. (West Germany). Inst. fuer Physiologie.
HYPOXIC HYPOXIA AS A STIMULUS OF ERYTHROPOIESIS IN VIVO AND IN VITRO
W. JELKMANN *In* DFVLR Proceedings and program draft in Gravitational Biology in the Federal Republic of Germany p 95-100 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The action of weightlessness on red blood volume in astronaut's anemia and on erythropoiesis leading to increased hemolysis is studied. Several generations of mice and rats bred in weightlessness were studied to determine the effects of weightlessness on the erythropoetic tissues, on erythropoiesis and on calcification. Causes of astronaut's anemia are listed. The effects of weightlessness on the erythropoietic system ontogenesis were measured based on circulative blood and erythrocyte volumes, the functional integrity of the hematopoietic tissue and the capacity of the erythropoietic system to react to hypoxia. ESA

N86-29525# Marburg Univ. (West Germany). Arbeitsgruppe Verhaltensphysiologie.
A LEARNING MODEL AS A BASIS FOR INVESTIGATIONS OF THE EFFECTS OF GRAVITY ON THE LEARNING PROCESSES AND MEMORY FORMULATION
C. BUCHHOLTZ *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 107-113 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The effects of gravity on learning strategy were studied using conditioned mice and a data acquisition computer system recording the daily performance of each mouse. The records are used to develop learning models. Increased gravity causes changes in the functional relationship between data storage units. These changes depend on the calculation result of proprioceptive feedbacks, and on time dependent effects represented by transmission of data from a short term memory related to the biophysical phase to long term memory related to the biochemical phase. ESA

N86-29526# Duesseldorf Univ. (West Germany). Inst. fuer Physikalische Biologie.
LONG-TERM ADAPTATION OF THE OTOLITH ORGANS
R. ECKMILLER *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 115-120 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Reduction in sensitivity of otolith organs in primates before a space mission and methods to reduce it were investigated to avoid space motion sickness. A procedure should be developed under neurophysiological control of the otolith afferences to influence the size and location of otoconia. ESA

N86-29527# Ulm Univ. (West Germany). Abt. Neurologie.
FUNCTIONAL DEVELOPMENT OF GRAVITY RECEPTORS IN INSECTS AND AMPHIBIANS
E. HORN *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 121-128 Oct. 1985 In GERMAN; ENGLISH summary Sponsored by Deutsche Forschungsgeimschaft
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Insects using a proprioceptive system and amphibians using a statocyst system were studied to analyze the functional development of a sensory system and its influence of the body muscle structure. The effects of micro-g through gravity receptors on the efficiency of the sensory system, on the adaptative mechanisms of the neuronal development under changing living conditions or under the animal pathological conditions, and on the hormonal environment are studied. The studies are based on eye reflex (Xenopus) and head reflex (Gryllus) and on equilibrium observations. ESA

N86-29528# Stuttgart Univ. (West Germany). Inst. fuer Zoologie.
FUNCTION-DEPENDENT PLASTICITY IN THE NERVOUS SYSTEM
H. RAHMANN and W. PROBST *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 135-139 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The tectum opticum of fish midbrain is studied to demonstrate the involvement of gangliosides in the functional plastic changes in synaptic systems and in visual acuity. The structural synaptic plasticity after light variations involving synaptic vesicles and after temperature variations involving the nervous system are studied using differential quantitative light and electronic microscopes. The biochemical neuronal plasticity after temperature variations involves sialo-glycoconjugate bonds and gangliosides. The molecule basic properties are determined using the monolayer technique for physico-chemical in vitro experiments with various neuronal membrane lipids combined with calcium ions. Further investigations are recommended to study neuronal plasticity in reduced or in absence of gravity. ESA

N86-29529# Bonn Univ. (West Germany). Zoologisches Inst.
MORPHOLOGY AND DEVELOPMENT OF THE INNER EAR OF ANURANS
H. SCHNEIDER and I. HERTWIG *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 141-146 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The Anuran inner ear consists of five sensory sections for orientation in space and perception of acoustic signals. Utriculus, sacculus and lagena are gravity receptors possessing otoliths. The ampullae of the semicircular canals are responsible for rotation sense. Papillia basilaris and papilla amphiborum allow respectively perception of high frequencies and low frequencies. The development of the labyrinth in amphibians begins after neurulation. The receptors consist of sensory cells and support cells. Experiments in simulated weightlessness show that the development of sensory epithelia and otoliths do not depend on gravity and should be confirmed by experiments in space. ESA

N86-29530# Bielefeld Univ. (West Germany). Abt. Neuroanatomie.
QUESTIONS ON THE EVOLUTION OF THE DEVELOPMENTAL PROGRAM OF THE VERTEBRATE INNER EAR UNDER LONG TERM ZERO G CONDITIONS
B. FRITZSCH *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 151-156 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

The long-term effects of weightlessness on the formation and function of the vestibular system are studied with particular focus on the persistence of motion defects of larva up to adult age, on the reproduction function, on the adaptation or selection of the offspring and hybrids resulting from successful reproduction under weightlessness, and on the sensory epithelium differentiation. The structural changes of the inner ear in adapted or selected offspring are studied using electronic microscope and the afferent and efferent connections using tracer methods. High generation succession frequency and offspring number, applicable reproductive behavior and easy culture, and live food are the minimum requirements for program implementation. ESA

N86-29531# Kiel Univ. (West Germany). Inst. fuer Meereskunde.
LONG DURATION CONFINEMENT OF AQUATIC ORGANISMS IN WEIGHTLESSNESS (AQUASPACE)
R. FROESE *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 159-164 Oct. 1985 In GERMAN; ENGLISH summary
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

A confinement facility resulting from the study of the transition phase between water and air was developed to study aquatic organisms in weightlessness. The facility is a closed system filled with water and consists of a central supply unit, confinement tanks, a lock system, a computer system for food supply control and measurement processing, videocameras monitoring growth, reproduction and behavior of the aquatic organisms, and two chambers to remove the gases released in water through a diffusion membrane and store oxygen in a gas mixture. The facility can be used to study the catabolism of the aquatic organisms in weightlessness and the effects of weightlessness and radiation on the reproduction biology. ESA

N86-29532# Ulm Univ. (West Germany). Abt. Neurologie.
PROGRAM DRAFT FOR A SPECIAL FIELD: GRAVITATIONAL BIOLOGY
E. HORN *In* DFVLR Proceedings and Program Draft in Gravitational Biology in the Federal Republic of Germany (DFVL R-Mitt-85-16) p 173-189 Oct. 1985 In GERMAN
Avail: NTIS HC A09/MF A01; DFVLR, Cologne DM 50

Gravitational biology as a special field for fundamental research on organism biology in weightlessness is discussed. Cellular and molecular biology, genetics; reproduction and development biology; vegetative biology and matter exchange biology; neurobiology; behavioral and motion physiology; population genetics, and evolution biology, and ecology and life preservation systems are suitable fields of research. The cooperation between the different field specialists and experts can contribute to the knowledge of body stabilization and plasticity and adaptativity in weightlessness. ESA

N86-29533# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIOR OF NONHUMAN PRIMATES Quarterly Technical Progress Report, 26 Sep. - 20 Dec. 1985
W. R. ROGERS 3 Jan. 1986 5 p
(Contract DE-AC02-80RA-50219)
(DE86-005067; DOE/RA-50219/T7; QTPR-20) Avail: NTIS HC A02/MF A01

This research program will evaluate the aversive character of exposure to 60 Hz electric fields by determining the threshold intensity which produces avoidance or escape responses, will estimate the threshold intensity for detection of 60 Hz electric fields, will assess effects of chronic exposure to 60 Hz electric fields on the performance of two operant conditioning tasks, fixed ratio and differential reinforcement of low rate responding, will investigate, using the systematic quantitative observational sampling methods of primatology, the possible stress-inducing effects of chronic exposure to 60 Hz electric fields on the behavior of baboons living in small social groups. In all experiments, the electric fields will be described, characterized, and controlled to account for recognized artifacts associated with high intensity 60 Hz electric fields and the health of all subjects will be described using the methods of primate veterinary medicine. DOE

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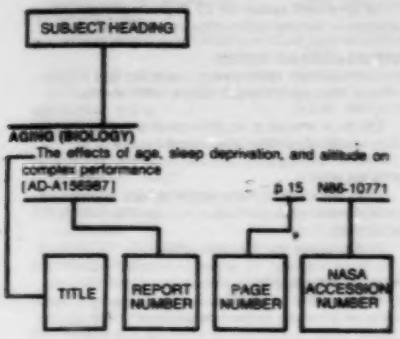

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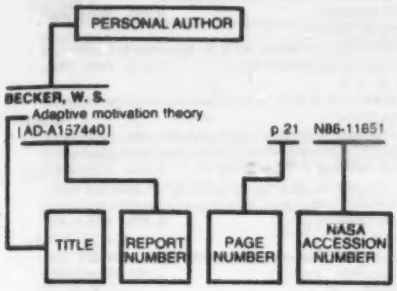

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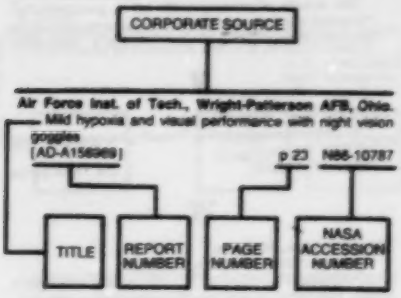

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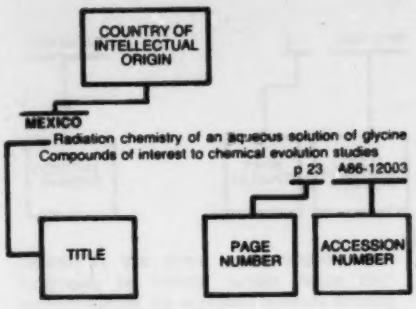
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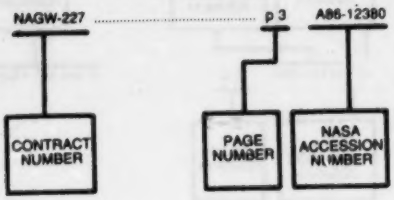

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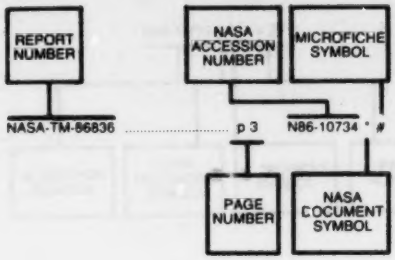

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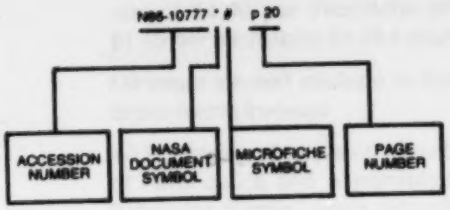

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16. Abstract

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17. Key Words (Suggested by Author(s))	18. Distribution Statement
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AEROSPACE MEDICINE AND BIOLOGY

A CONTINUING BIBLIOGRAPHY WITH INDEXES

(Supplement 291)

A selection of annotated references to unclassified reports and journal articles that were introduced into the NASA scientific and technical information system and announced in November 1986 in

- *Scientific and Technical Aerospace Reports (STAR)*
- *International Aerospace Abstracts (IAA).*

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INTRODUCTION

This Supplement to *Aerospace Medicine and Biology* lists 131 reports, articles and other documents announced during November 1986 in *Scientific and Technical Aerospace Reports (STAR)* or in *International Aerospace Abstracts (IAA).* The first issue of the bibliography was published in July 1964.

In its subject coverage, *Aerospace Medicine and Biology* concentrates on the biological, physiological, psychological, and environmental effects to which man is subjected during and following simulated or actual flight in the Earth's atmosphere or in interplanetary space. References describing similar effects of biological organisms of lower order are also included. Such related topics as sanitary problems, pharmacology, toxicology, safety and survival, life support systems, exobiology, and personnel factors receive appropriate attention. In general, emphasis is placed on applied research, but references to fundamental studies and theoretical principles related to experimental development also qualify for inclusion.

Each entry in the bibliography consists of a bibliographic citation accompanied in most cases by an abstract. The listing of the entries is arranged by *STAR* categories 51 through 55, the Life Sciences division. The citations, and abstracts when available, are reproduced exactly as they appeared originally in *IAA* or *STAR,* including the original accession numbers from the respective announcement journals. The *IAA* items will precede the *STAR* items within each category.

Seven indexes — subject, personal author, corporate source, foreign technology, contract, report number, and accession number — are included.

An annual index will be prepared at the end of the calendar year covering all documents listed in the 1986 Supplements.

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Includes physiological factors; biological effects of radiation; and weightlessness.

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Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

Category 54 Man/System Technology and Life Support 405
Includes human engineering; biotechnology; and space suits and protective clothing.

Category 55 Planetary Biology 410
Includes exobiology; and extraterrestrial life.

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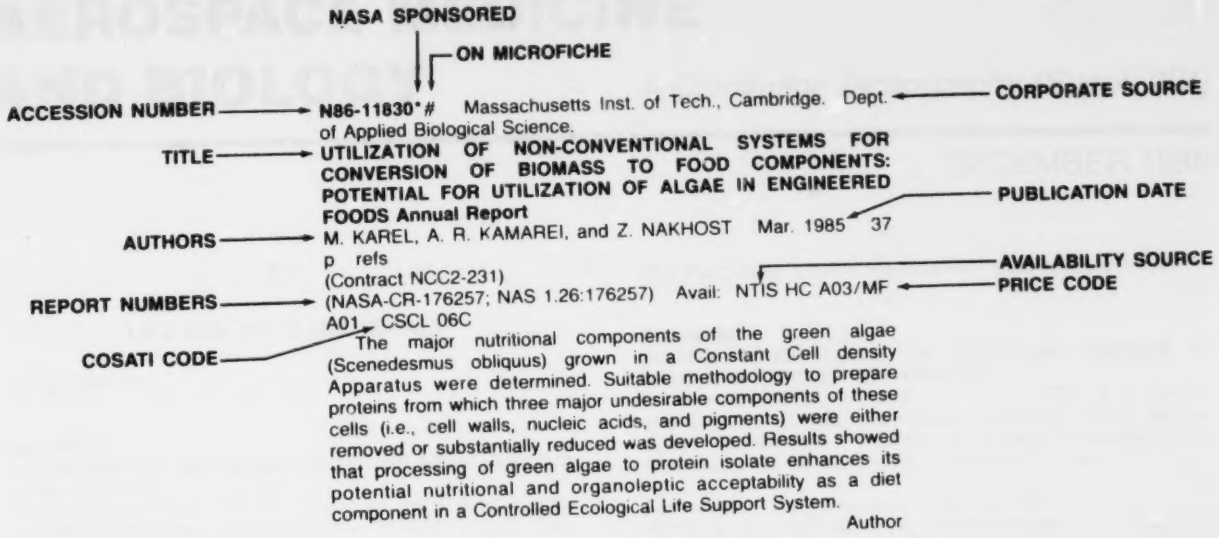
TYPICAL REPORT CITATION AND ABSTRACT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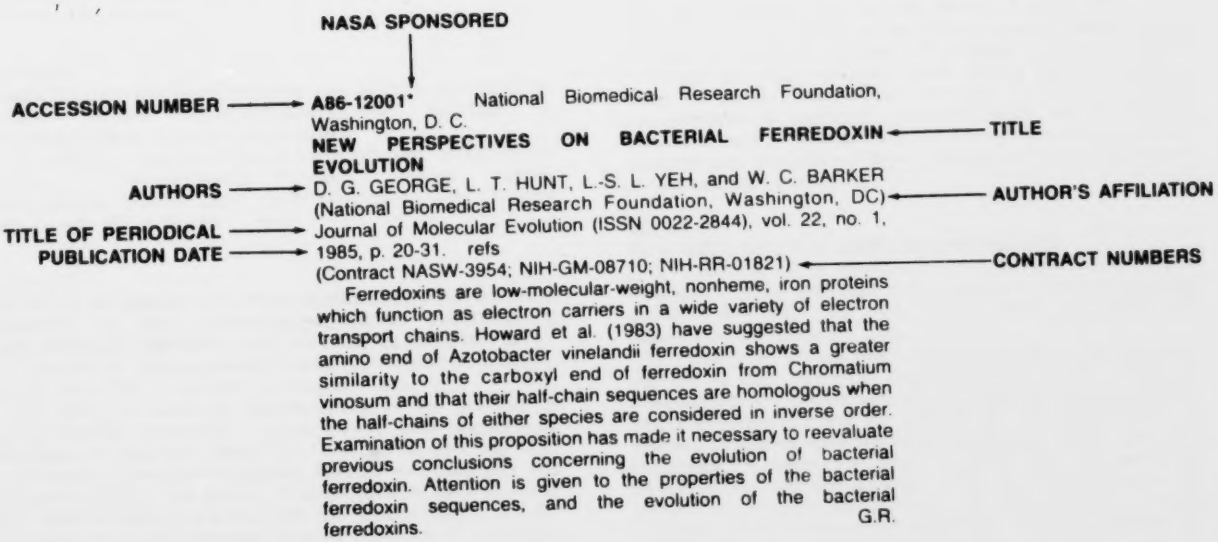
ACCESSION NUMBER
N86-11830* # Massachusetts Inst. of Tech., Cambridge. Dept. of Applied Biological Science.
CORPORATE SOURCE
TITLE
UTILIZATION OF NON-CONVENTIONAL SYSTEMS FOR CONVERSION OF BIOMASS TO FOOD COMPONENTS: POTENTIAL FOR UTILIZATION OF ALGAE IN ENGINEERED FOODS Annual Report
PUBLICATION DATE
AUTHORS
M. KAREL, A. R. KAMAREI, and Z. NAKHOST Mar. 1985 37 p refs
(Contract NCC2-231)
AVAILABILITY SOURCE
REPORT NUMBERS
(NASA-CR-176257; NAS 1.26:176257) Avail: NTIS HC A03/MF A01 CSCL 06C
PRICE CODE
COSATI CODE
The major nutritional components of the green algae (Scenedesmus obliquus) grown in a Constant Cell density Apparatus were determined. Suitable methodology to prepare proteins from which three major undesirable components of these cells (i.e., cell walls, nucleic acids, and pigments) were either removed or substantially reduced was developed. Results showed that processing of green algae to protein isolate enhances its potential nutritional and organoleptic acceptability as a diet component in a Controlled Ecological Life Support System.
Author

TYPICAL JOURNAL ARTICLE CITATION AND ABSTRACT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ACCESSION NUMBER
A86-12001* National Biomedical Research Foundation, Washington, D. C.
TITLE
NEW PERSPECTIVES ON BACTERIAL FERREDOXIN EVOLUTION
AUTHORS
D. G. GEORGE, L. T. HUNT, L.-S. L. YEH, and W. C. BARKER
AUTHOR'S AFFILIATION
(National Biomedical Research Foundation, Washington, DC)
TITLE OF PERIODICAL
Journal of Molecular Evolution (ISSN 0022-2844), vol. 22, no. 1,
PUBLICATION DATE
1985, p. 20-31. refs
CONTRACT NUMBERS
(Contract NASW-3954; NIH-GM-08710; NIH-RR-01821)
Ferredoxins are low-molecular-weight, nonheme, iron proteins which function as electron carriers in a wide variety of electron transport chains. Howard et al. (1983) have suggested that the amino end of Azotobacter vinelandii ferredoxin shows a greater similarity to the carboxyl end of ferredoxin from Chromatium vinosum and that their half-chain sequences are homologous when the half-chains of either species are considered in inverse order. Examination of this proposition has made it necessary to reevaluate previous conclusions concerning the evolution of bacterial ferredoxin. Attention is given to the properties of the bacterial ferredoxin sequences, and the evolution of the bacterial ferredoxins.
G.R.

AEROSPACE MEDICINE AND BIOLOGY

A Continuing Bibliography (Suppl. 291)

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LIFE SCIENCES (GENERAL)

Includes genetics.

A86-43540#
ALTERATION OF RAT BRAIN CATECHOLAMINE LEVELS UNDER HYPOXIA
I. SAKURAI and A. NAKAMURA Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, Dec. 1985, p. 181-186. In Japanese, with abstract in English. refs

An investigation was conducted to ascertain the effects that hypobaric and hypoxic hypoxia have on catecholamine (CA) synthesis in the brain of a rat. Male Wistar rats were exposed to either a simulated altitude of 18,000 ft (corresponding to 10.5 percent O2) for a time period approaching 72 hrs or to hypoxic gas mixtures (10, 7 and 6 percent O2) for a period of 2 hrs. Norephinephrine (NE) concentration decreased initially and then stabilized at the control level despite continued hypoxic conditions at 18,000 ft. Dopamine (DA) levels significantly increased upon 6 hrs of hypoxic exposure and ultimately stabilized at the control level. The increment at which DA decreased upon 2 hrs of hypoxic exposure was parallel to the severity of the hypoxia. The NE concentration decreased linearly with the concentration of oxygen present during exposure. K.K.

A86-43676
DIGESTIVE SYSTEM RHYTHMS AND THE BODY'S BIOLOGICAL CLOCK [RITMY PISHCHEVARITEL'NOI SISTEMY I BIOLOGICHESKIE 'CHASY' ORGANIZMA]
N. N. LEBEDEV (Nauchno-Issledovatel'skii Institut Obshchei Patologii i Patologicheskoi Fiziologii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, April 1986, p. 466-475. In Russian. refs

A86-43677
THE ROLE OF GRAVITY IN PRODUCING DIGESTIVE SYSTEM CHANGES [O ROLI GRAVITATSIONNOGO FAKTORA V FORMIROVANII IZMENENII PISHCHEVARITEL'NOI SISTEMY]
K. V. SMIRNOV Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, April 1986, p. 484-489. In Russian. refs

The effect of sustained weightlessness on the activities of gastraintestinal proteases, carbohydrases, and lipases was investigated in rats flown aboard the Cosmos 782, 936, and 1129 biosatellites. Homogenized gastric mucosa and pancreas and homogenized and intact mucosa of small intestine were analyzed 5-6 h after landing. Compared with the ground-based controls, rats exposed to weightlessness exhibited activation of proteolytic enzymes and pancreatic lipase and suppression of amylase activity. The activity of intestinal lipase was redistributed: a decrease in the proximal segment was accompanied with a significant increase in the distal end. The morphological examination of gastric mucosa revealed signs of hypersecretion syndrome. The use of artificial gravity during flights had a normalizing effect on proteolytic enzymes but suppressed the activity of pancreatic amylase even more and had no effect on lipolytic activities. Twenty-five days after the landing, enzyme activities were close to control levels. I.S.

A86-44195
SOLUTE CONDUCTANCE OF BLOOD-GAS BARRIER IN HAMSTERS EXPOSED TO HYPEROXIA
D. WANGENSTEEN, R. PIPER, J. A. JOHNSON, A. A. SINHA, and D. NIEWOEHNER (Minnesota, University; USVA, Medical Center, Minneapolis) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, June 1986, p. 1908-1916. refs

A86-44196* Marquette Univ., Milwaukee, Wis.
MODELS OF DISUSE - A COMPARISON OF HINDLIMB SUSPENSION AND IMMOBILIZATION
R. H. FITTS, J. M. METZGER, D. A. RILEY, and B. R. UNSWORTH (Marquette University; Wisconsin, University, Milwaukee) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, June 1986, p. 1946 1953. refs
(Contract NAG2-212; NCC2-266)

The effects of 1 and 2 weeks of hindlimb suspension (HS) on the contractile properties of fast- and slow-twitch skeletal muscles of male Sprague Dawley rats are studied and compared with hindlimb immobilization (HI) data. The optimal length and contractile properties of the slow-twitch soleus, fast-twitch extensor digitorum longus, and the vastus lateralis are measured. It is observed that HS and HI affect slow-twitch muscles; isometric twitch duration in the slow-twitch soleus is decreased. Soleus muscle mass and peak tetanic tension declines with disuse. A major difference in the influence of HS and HI on the maximal speed of soleus muscle shortening, V(max) is detected; HS produced a twofold increase in V(max) compared to control data and HI had no significant effect on V(max). The relation between V(max) and myosin concentration is analyzed. The data reveal that HS modifies slow-twitch muscle yielding hybrid fibers with elevated shortening velocities and this change may be dependent on the elimination of load-bearing contractions. I.F.

A86-44197
HOW WELL MIXED IS INERT GAS IN TISSUES?
L. D. HOMER and P. K. WEATHERSBY (U.S. Navy, Naval Medical Research Institute, Bethesda, MD) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, June 1986, p. 2079-2088. Navy-supported research. refs

Potential mechanisms which cause multiexponential curves for washout of inert gas from tissues are examined. Computer simulations of the random walk of gas molecules across a capillary bed are conducted and the data reveal that heterogeneity in adjacent capillaries does not cause significant relative dispersion to produce the curves. The effect of variable flow and transit time on the relative dispersion are studied. The countercurrent exchange and isotropic diffusion are analyzed. It is observed that variations in spacing and countercurrent exchange between capillaries do not produce the multiexponential character of tissue washout curves. Simple diffusion calculations are utilized to display that gas molecules can wander up to several millimeters away from their entry point during an average transit through a tissue bed. It is noted that gas molecules enter and exit tissues from vessels larger than 20 microns in diameter rather than capillaries. A hypothesis that the multiexponential character of skeletal muscle tissue inert gas washout curves are due to either heterogeneity

between tissue regions separated by 3 mm or more, or to countercurrent exchange in vessels larger than 2 microns in diameter is proposed. I.F.

A86-44295
THE PHOTOBIOLOGICAL ASPECTS OF RADIATION DAMAGE IN CELLS [FOTOBIOLOGICHESKIE ASPEKTY RADIATSIONNOGO PORAZHENIIA KLETOK]
M. N. MIASNIK, V. G. SKVORTSOV, and V. A. SOKOLOV Moscow, Energoatomizdat, 1985, 152 p. In Russian. refs

The cellular and molecular mechanisms of radiation damage caused in microorganisms by ionizing radiation and UV light are described, together with the mechanisms of photoreactivation by visible light. The role of DNA-located pyridine dimers in such radiobiological phenomena as the oxygen effect, radioprotective effects, and the relative biological effectiveness of ionizing radiation is considered. Special attention is given to photorecoverable damages connected with Cerenkov radiation. A biophysical model is presented for bacterial cells reacting to radiation by gamma rays. I.S.

A86-45251* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTINUOUS BLOOD DENSITOMETRY - FLUID SHIFTS AFTER GRADED HEMORRHAGE IN ANIMALS
H. HINGHOFER-SZALKAY (NASA, Ames Research Center, Moffett Field, CA; Graz, Universitaet, Austria) American Journal of Physiology: Heart and Circulatory Physiology (ISSN 0363-6135), vol. 19, 1986, p. H342-H350. refs
(Contract FFWF PROJECT 3470)

Rapid fluid shifts in four pigs and two dogs subjected to graded hemorrhage are investigated. Arterial blood density (BD), mean arterial pressure (MAP), central venous pressure (CVP), arterial plasma density (PD), hematocrit (Hct) and erythrocyte density were measured. The apparatus and mechancial oscillator technique for measuring density are described. Fluid shifts between red blood cells and blood plasma and alterations in the whole-body-to-large vessel Hct, F(cell) are studied using two models. The bases of the model calculations are discussed. A decrease in MAP, CVP, and BP is detected at the beginning of hemorrhaging; continued bleeding results in further BD decrease correlating with volume displacement. The data reveal that at 15 ml/kg blood loss the mean PD and BD dropped by 0.99 + or - 0.15 and 2.42 + or 0.26 g/liter, respectively, and the Hct dropped by 2.40 + or 0.47 units. The data reveal that inward-shifted fluid has a higher density than normal ultrafiltrate and/or there is a rise in the F(cell) ratio. It is noted that rapid fluid replacement ranged from 5.8 + or - 0.8 to 10.6 + or - 2.0 percent of the initial plasma volume. I.F.

A86-45318
THE EFFECTS OF CEREBRAL HYPOXIA AND HYPERVENTILATORY HYPOCAPNIA ON THE EPILEPTIFORM ACTIVITY IN THE CEREBRAL CORTEX OF CATS [DEISTVIE TSEREBRAL'NOI GIPOKSII I GIPERVENTILIATSIONNOI GIPOKAPNII NA EPILEPTIFORMNUIU AKTIVNOST' KORY BOL'SHIKH POLUSHARII KOSHKI]
S. I. FRANKSHTEIN, L. N. SMOLIN, and L. N. SERGEEVA (Institut Obshchoi Patologii i Patologicheskoi Fiziologii, Moscow, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 576-579. In Russian. refs

A86-45319
THE SUPPRESSIVE EFFECT OF CARBON DIOXIDE ON THE ACTIVATION OF COLD RECEPTORS IN THE NASAL CAVITY OF CATS [PODAVLIAIUSHCHEE VLIIANIE DVUOKISI UGLERODA NA VOZBUZHDENIE KHOLODOVYKH RETSEPTOROV POLOSTI NOSA KOSHKI]
V. D. GLEBOVSKII and A. V. BAEV (Pediatricheskii Meditsinskii Institut, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 595-602. In Russian. refs

The effect of carbon dioxide concentration in the air passing through the nasal cavity on the afferent fiber impulse activity were studied in decerebrated cats. Passage of air through the nasal cavity in the direction from the nostrils to the choanes effected strong activation of cold receptors in the nasal cavity walls. When air was drawn in the opposite direction (i.e., 'exhaled'), the receptors' activity decreases. When a 1, 3, or 6-percent CO2-air mixture was blown through the nasal cavity, the cold receptor activity became depressed in direct proportion to the CO2 concentration. Thus, like the receptors in the process that regulates lung distension, the cold thermoreceptors in the nasal cavity possess characteristics of chemoreceptors. I.S.

A86-45320
CORRELATIONS BETWEEN THE LEVELS OF CEREBRAL BLOOD FLOW AND CEREBROVASCULAR REACTIVITY AND THE FUNCTIONAL STATE OF BRAIN TISSUE [O VZAIMOSVIAZI UROVNIA KROVOTOKA I REAKTIVNOSTI MOZGOVYKH SOSUDOV S FUNKTSIONAL'NYM SOSTOIANIEM TKANI MOZGA]
B. V. GAIDAR, V. N. SEMERNIA, and G. B. VAINSHTEIN (AN SSSR, Institut Evoliutsionnoi Fiziologii i Biokhimii; Voenno-Meditsinskaia Akademiia, Leningrad, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 603-611. In Russian. refs

Changes in the cerebral blood flow and reactivity of brain vessels to CO2, taking place during the process of brain restoration, were studied in rabbits with experimental local brain lesions. In the zones within a 15-mm distance from the lesion focus, a decrease in the local blood flow was observed, with a minimum on the 2nd to 5th day after the lesion, followed by normalization on the 10th-14th day. The cerebrovascular reactivity to CO2 decreased and returned to normal in a fashion similar to that exhibited by the blood flow, indicating that the vascular reactivity can serve as a valuable criterion in evaluating the process of functional restoration in brain tissue. I.S.

A86-45321
CHANGES IN PERICARDIAL MICROCIRCULATION IN DOGS DURING ADAPTATION TO STATIC MUSCLE LOADS [IZMENENIIA MIKROTSIRKULIATSII PERIKARDA U SOBAK PRI ADAPTATSII K STATICHESKIM MYSHECHNYM NAGRUZKAM]
V. A. SHESTAKOV, A. V. MURAVEV, and L. G. ZAITSEV (Gosudarstvennyi Pedagogicheskii Institut, Yaroslavl, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 625-631. In Russian. refs

Physiological changes in cardiovascular and respiratory systems were correlated with morphological changes taking place in the pericardial microcirculatory system of dogs adapted for 6 weeks to loads sustained daily for 1 hr at a time. The observed changes in pulse rate, respiratory rate, oxygen consumptions, and vascular permeability, which indicated increased efficiency of the cardiovascular and respiratory systems, were accompanied by beneficial morphological changes in the pericardial microcirculation. These changes included decreased vascular diffusion area, capillary diameters, and blood volume, and an increased number of capillary vessels. All changes reversed during deadaptation. I.S.

A86-45322
THE CONTRACTILE FUNCTION AND THE ENERGY METABOLISM OF THE MYOCARDIUM UNDER EMOTIONAL STRESS AND DURING ADAPTATION OF ANIMALS TO SHORT STRESS EFFECTS [SOKRATITEL'NAIA FUNKTSIIA I ENERGETICHESKII METABOLIZM MIOKARDA PRI EMOTSIONAL'NOM STRESSE I ADAPTATSII ZHIVOTNYKH K KOROTKIM STRESSORNYM VOZDEISTVIIAM]
V. V. MALYSHEV, L. S. KATKOVA, V. I. LIFANTEV, and T. P. DVORETSKAIA (Gosudarstvennyi Meditsinskii Institut, Irkutsk, USSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 632-636. In Russian. refs

A86-45323
THE EFFECT OF HYPOXIA ON THE DYNAMICS OF THE PERIPHERAL LYMPH FLOW [DINAMIKA IZMENENII PERIFERICHESKOGO LIMFOTOKA PRI DEISTVII GIPOKSII]
S. G. TOPOROVA (Tadzhikskii Gosudarstvennyi Meditsinskii Institut Dushanbe, Tadzhik SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 642-649. In Russian. refs

The effect of hypoxia (1-60 min at 5000 m in a decompression chamber) on the dynamics of the direction and speed of the lymph flow in the mesenteric vessels of rats with exposed mesenterium was investigated by means of an attached microscopic installation. The vessels' locomotor reaction to hypoxia and the changes in the vessel valve activity were also observed. Five minutes after introduction of the hypoxic condition, an increase in the lymph flow was observed, due to the following compensatory changes in the lymph vessels: a vasodilation, a decrease in the frequency of the spontaneous changes in the vessel lumen and an increase in the amplitude of these changes, and a synchronization of locomotion in lymphangiomas. During the duration of hypoxia the lymph valves remained open, with a steady distance maintained between the cuspate ends, except for brief periods of closing during equilibration of hydrostatic pressure between adjacent vessel segments. It is suggested that the funnel-like shape of the lymph valve causes a hydrostatic pressure drop (due to increased flow speed), in its narrow segment leading to a sucking effect, which in turn promotes lymph movement. I.S.

A86-45324
THE CONTENT OF LACTIC ACID IN THE BLOOD AND ERYTHROPOIESIS DURING HYPOXIA [SODERZHANIE MOLOCHNOI KISLOTY V KVOVI I ERITROPOEZ V USLOVIIAKH GIPOKSII]
M. IA. SHCHUKINA (AN KSSR, Institut Fiziologii i Eksperimental'noi Patologii Vysokogori'ia Frunze, Kirgiz SSR) Fiziologicheskii Zhurnal SSSR (ISSN 0015-329X), vol. 72, May 1986, p. 668-672. In Russian. refs

The effects of acute blood loss and elevated altitude on the blood titers of lactic acid, erythrocytes, and hemoglobin were studied in rats bled to 20 to 25 percent blood loss and adapted to 760 m above the sea level, and then to 1700 m. Acute blood loss caused a threefold increase in lactic acid concentration as soon as 20 min after the bleeding, while the erythropoietic indices changed only days later. By the time the hemoglobin and erythrocyte titers increased significantly, the lactic acid titer was again at the control level. The degree of lactacemia was found to decrease with adaptation to high altitude, and was lower in female, compared with male, rats. The observed sequence of the lactacemic and erythropoietic changes supports the hypothesis of the lactacemia-induced onset of erythropoiesis. I.S.

A86-45960* Salk Institute for Biological Studies, San Diego, Calif.
TEMPLATE-DIRECTED OLIGONUCLEOTIDE LIGATION ON HYDROXYLAPATITE
O. L. ACEVEDO and L. E. ORGEL (Salk Institute for Biological Studies, San Diego, CA) Nature (ISSN 0028-0836), vol. 321, June 19, 1986, p. 790-792. refs
(Contract NGR-05-067-001)

It has been suggested that the prebiotic synthesis of the precursors of biopolymers could have occurred on a solid surface such as that provided by clay or some other mineral. One such scheme envisages that growing polymers were localized by adsorption to a mineral surface where an activating agent or activated monomers were supplied continuously or cyclically. Here, it is reported that a sequence of reactions in which initially formed oligo(G)s are reactivated by conversion to phosphorimidazolides in the presence of poly(C) and then allowed to ligate is ideal, in that repeated cycles can be carried out on the surface of hydroxylapatite, whereas in the liquid phase the cycle could be achieved only with considerable difficulty. C.D.

A86-46960#
SPACE STATION - LIFE SCIENCES
R. S. YOUNG (Management and Technical Services Co., Washington, DC) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 4 p.
(AIAA PAPER 86-2346)

The use of the Space Station for biomedical research and the study of biological cellular and subcellular processes is described. The research will require: (1) a health maintenance facility, (2) a life science research facility, and (3) instruments and platforms for automatic experiments. Experiments analyzing physiological changes induced by microgravity and the relationship between gravity, cellular and organismal physiology, and biochemistry are to be performed on the Station. The development of closed ecological life support systems is to be studied on the Space Station. The Station's facilities are also to be utilized to examine the interaction of the earth's biota with the planet environment, and the origin, evolution, and distribution of life throughout the universe. I.F.

N86-30302*# National Aeronautics and Space Administration, Washington, D.C.
LIFE SCIENCES SPACE STATION PLANNING DOCUMENT: A REFERENCE PAYLOAD FOR THE LIFE SCIENCES RESEARCH FACILITY
Aug. 1986 132 p
(NASA-TM-89188; NAS 1.15:89188) Avail: NTIS HC A07/MF A01 CSCL 06B

The Space Station, projected for construction in the early 1990s, will be an orbiting, low-gravity, permanently manned facility providing unprecedented opportunities for scientific research. Facilities for Life Sciences research will include a pressurized research laboratory, attached payloads, and platforms which will allow investigators to perform experiments in the crucial areas of Space Medicine, Space Biology, Exobiology, Biospherics and Controlled Ecological Life Support System (CELSS). These studies are designed to determine the consequences of long-term exposure to space conditions, with particular emphasis on assuring the permanent presence of humans in space. The applied and basic research to be performed, using humans, animals, and plants, will increase our understanding of the effects of the space environment on basic life processes. Facilities being planned for remote observations from platforms and attached payloads of biologically important elements and compounds in space and on other planets (Exobiology) will permit exploration of the relationship between the evolution of life and the universe. Space-based, global scale observations of terrestrial biology (Biospherics) will provide data critical for understanding and ultimately managing changes in the Earth's ecosystem. The life sciences community is encouraged to participate in the research potential the Space Station facilities will make possible. This document provides the range and scope of typical life sciences experiments which could be performed within a pressurized laboratory module on Space Station. Author

N86-31207# Naval Research Lab., Washington, D. C.
ADVANTAGES OF THE GAS EXCHANGE APPROACH TO MICROBIOLOGICAL STUDIES Memorandum Report, 1983 - 1985
P. J. HANNAN and D. S. JONES 3 Apr. 1986 43 p
(AD-A166887; NRL-MR-5744) Avail: NTIS HC A03/MF A01 CSCL 06M

Studies of the effects of various chemical or physical stimuli on the growth rates of microorganisms generally involve some measure of biomass. In the case of algae, one might measure the cell number, the chlorophyll concentration, the fluorescence, or the wet weight of the culture as a function of time. Each such measurement requires a sampling of the culture which could be a disturbing factor in the system being measured. Another disadvantage of these traditional measurements is that the times required for significant change to take place in the culture might be hours or days; furthermore, growth rate measurements calculated from the data must be based on the assumption that during the time between measurements the growth rate was

constant. This report describes another approach to the problem. It consists simply of monitoring the O2 or CO2 concentration of an air stream passing through the system (the gas exchange method), and it has several distinct advantages: (1) there is no need to take samples of the culture, (2) each measurement is a rate measurement and indicates the performance of the culture at that very moment, and (3) transitory changes in growth rates are readily detected. Examples are given of studies made previously with this method at NRL. Also the possible value of these methods in a study of the corrosion susceptibility of alloys is described.
GRA

N86-31208# Georgia Univ., Athens. Dept. of Chemistry.
THE PREDICTION OF BIOLOGICAL ACTIVITY USING MOLECULAR CONNECTIVITY INDICES
D. H. ROUVRAY 23 Apr. 1986 31 p
(Contract N00014-84-K-0365)
(AD-A166986; TR-21) Avail: NTIS HC A03/MF A01 CSCL 06O

A highly influential paper by Randic entitled On characterization of molecular branching appeared in the Journal of the American Chemical Society. In this paper a new topological index was introduced which has since become known as the molecular connectivity index. Topological indices (Tis) are graph-theoretical invariants which are employed extensively as matheamtical descriptors for a wide range of molecular species. They have been used mainly for the purpose of correlating the properties of molecular species with their topological structure. The molecular connectivity index was originally put forward with the aim of characterizing the branching in alkane species, but more recently has been shown to have numerous applications in both the physical and biological sciences. In this review we shall focus on the use of the index in the more biologically oriented sciences, such as pharmacology and toxicology. In particular, we shall discuss the prediction of biological activity in chemical species by means of this index. The molecular connectivity index as originally presented by Randic was designed to parallel the ordering obtained for sets of isomeric alkane molecules based on their physicochemical properties.
GRA

N86-31209# University of Southern California, Los Angeles.
LASER KINETIC SPECTROSCOPY OF UNIMOLECULAR AND BIMOLECULAR PROCESSES IN THE GAS PHASE Final Report, 1 Oct. 1982 - 30 Sep. 1985
C. WITTIG and H. REISLER 15 Nov. 1985 14 p
(Contract AF-AFOSR-0022-83)
(AD-A166998; AFOSR-86-0226TR) Avail: NTIS HC A02/MF A01 CSCL 07E

This research is concerned with the study of unimolecular processes in the gas phase. We concentrated on simple bond fission reactions, and determined both the collision free unimolecular rates Benzylamine (C6H5CH2NH2), Nitrosomethane (CH3)3CNO), and the energy disposal in the products Nitrosyl cyanide (NCN0), Trifluoronitrile methane (CF3CN), Cyanogeniodide (ICN). Most of the molecules were dissociated either via IRMPD(CF3CN, C6H5CH2NH2) or by electronic excitation followed by radiationless transitions (NCNO(CH3)3CNO). They exhibited statistical behavior, and the results were compared with the predictions of statistical theories. The most detailed experiments involved the photodissociation of NCNO, which provided complete mapping. of product internal states. The CN and NO E,V,R distributions are textbook examples of statistical product state distributions deriving from a unimolecular reaction. In our studies of the direct photodissociation of ICN, we obtained sub-Doppler LIF spectra of nascent CN(X2 sigmat state), following the 266 nm photolysis of 300 K molecules. These studies provided a detailed picture of the fragment recoil spatial anisotropies as well as CN E,V,R, T and and I/I excitations. The CN rotational distributions were dissected into two separate distributions for the channels producing I and I.
GRA

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AEROSPACE MEDICINE

Includes physiological factors; biological effects of radiation; and weightlessness.

A86-43750
THE INVERSE PROBLEM IN ELECTROCARDIOGRAPHY - A MODEL STUDY OF THE EFFECTS OF GEOMETRY AND CONDUCTIVITY PARAMETERS ON THE RECONSTRUCTION OF EPICARDIAL POTENTIALS
B. J. MESSINGER-RAPPORT and Y. RUDY (Case Western Reserve University, Cleveland, OH) IEEE Transactions on Biomedical Engineering (ISSN 0018-9294), vol. BME-33, July 1986, p. 667-676. Research supported by the American Heart Association and North East Ohio Affiliate, Inc. refs
(Contract NIH-HL-33343; NIH-HL-17931; NIH-GM-07250)

An eccentric spherical model is utilized to study the effects of variations in torso geometry and volume conductivity parameters on the accuracy of the recovered epicardial potentials and the orthogonal expansion terms. The solution to the electrocardiographic inverse problem of the eccentric sphere is presented. The ability to distinguish separate local electrical events on the epicardium is examined. The data reveal that changes in the conductivity and geometry parameters influence the amplitude, resolution, and position of the reconstructed epicardial potentials; proper estimations of secondary sources external to the epicardium and geometry parameter are necessary for accurate recovery of epicardial potentials. The application of the homogeneous assumption to inverse-recovered epicardial potentials results in good recovery of anterior epicardial potentials; however, resolution loss for posterior potentials is detected. Deviations in the conductivity of the lungs and skeletal muscle tissue and incorrect estimation of the heart size affect the recovery of the anterior and posterior epicardial potentials.
I.F.

A86-44087
CIRCADIAN VARIATIONS OF SYSTOLIC TIME INTERVALS
J. TIMBAL, J. COLIN, and H. MAROTTE (Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 642-646. refs

In order to test the reality of a circadian evolution of systolic time intervals, an experiment was conducted on six subjects resting in a supine position for 24 h. Heart rate (HR), systole (S), diastole (D), presystole (PS), isovolumetric contraction time (IVCT), normal and corrected ventricular preejection and ejection time were computed by electric rheoplethysmography every 3 h in supine and sitting positions. Evidence of the existence of a circadian rhythm was clear in supine subjects; especially left preejection period (LPEP) and left ventricular ejection time (LVET) acrophases were, respectively, 4.03 + or - 2.36 h and 4.31 + or - 1.15 h. In sitting subjects, a circadian rhythm was evidenced for IVCT, corrected left ventricular ejection time, and LPEP/LVET, and on the difference of resting-sitting for PS, IVCT, and LPEP, suggesting a decrease in orthostatic tolerance at the end of the night. However, values for characteristics of circadian rhythms (mean, amplitude, phase) strongly depend upon experimental conditions (position, activity, diet). A phase difference between systolic times and HR was also observed. This phenomenon was due to an advance in phase of D relative to S. Finally, all these results show that it is always necessary to take circadian factors into consideration during cardiovascular studies, especially for the preparation of protocols and the interpretation of results.
Author

A86-44088
NALOXONE ENHANCES MOTION SICKNESS - ENDORPHINS IMPLICATED
M. E. ALLEN, C. MCKAY, D. M. EAVES, and D. HAMILTON (Simon Fraser University, Burnaby; Lions Gate Hospital, North Vancouver, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 647-653. refs

This study evaluated the time course to malaise III in human subjects given naloxone and placebo with a double-blind crossover protocol in the prevention of motion sickness induced by exposure to coriolis stimulation in a rotating chair. During naloxone tests, subjects reached the designated level of sickness sooner than during the placebo testing (significance greater than 0.05) and their discomfort lingered for up to 3 d, a feature not seen with the placebo. This implicates endogenous opiates with an endogenous protective or adaptive role in the control of motion sickness. It is suggested that when subjects experience endogenous opioid withdrawal, such as post exercise, they could be in a state of neuron hypersensitivity, and thus more prone to any form of exogenous emetic stimuli. Greater tolerance to motion stresses could be experienced in subjects whose endorphins were repeatedly elevated, thus avoiding a hypersensitivity state from endogenous opiate withdrawal. Subjects whose endorphins have not been elevated in the first instance cannot secondarily suffer opioid abstinence. Author

A86-44089
SINGLE SINUSOIDS COMPARED WITH A MULTIPLE-SINUSOIDS TECHNIQUE FOR EVALUATING HORIZONTAL SEMICIRCULAR CANAL FUNCTION
J. W. WOLFE, E. J. ENGELKEN, K. W. STEVENS, and J. E. OLSON (USAF, School of Aerospace Medicine, Brooks AFB; USAF, Medical Center, Lackland AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 667-670. refs

The vestibulo-ocular reflex (VOR) of 162 normal subjects was evaluated using two rotational testing procedures. Data from 79 subjects were collected using a set of five single-frequency stimuli (0.01 to 0.16 Hz) and 83 subjects were tested using multifrequency stimuli (0.01 to 0.27 Hz). The use of multifrequency stimuli in place of single frequencies reduced testing time from 75 min to 20 min per subject. The diagnostically useful phase response of the VOR, as estimated by the two tests, were not statistically different. Equivalent phase measures may be obtained within a shorter testing period using the multifrequency procedure. Author

A86-44090
INHIBITORY EFFECTS OF COMBINED AGONIST AND ANTAGONIST MUSCLE VIBRATION ON H-REFLEX IN MAN
B. J. MARTIN (Institut National de Recherche et de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles, Vandoeuvre, France), J. P. ROLL, and G. M. GAUTHIER (Aix-Marseille I, Universite, Marseille, France) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 681-687. Research supported by Institut National de Recherche et de Securite pour la Prevention des Accidents du Travail et des Maladies Professionnelles and CNRS. refs

The differential effects of vibration locally applied to gastrocnemius soleus and tibialis anterior muscles separately and to both muscles simultaneously are studied. From the results, it is deduced that combined agonist and antagonist muscle vibration may lead to summative interaction between pre- and postsynaptic inhibition at motoneuronal level. Whole-body vibration is taken to mean a combination of synchronous vibrations applied locally and simultaneously to several muscles. The results also demonstrate that the level of inhibition of the H-reflex resulting from the vibration is directly related to the displacement amplitude of the vibration, regardless of the frequency. Author

A86-44091
THE POSSIBLE INVOLVEMENT OF PGI2 IN THE PEEP-INDUCED CHANGES IN CARDIAC OUTPUT AND BLOOD PRESSURE
W. DURANTE and F. A. SUNAHARA (Toronto, University, Canada) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 688-693. Research supported by the Ontario Heart Foundation and Department of National Defence of Canada. refs

Ventilation with positive end-expiratory pressure (PEEP) is employed in clinical and aviation medicine. The widespread application of PEEP, however, is limited principally because of its adverse effect on cardiac output (CO) and systemic arterial blood pressure (BP). Recently, it has been suggested that this PEEP-induced cardiovascular depression may be mediated by vasoactive agents, possibly prostaglandin in nature. This study examined the possible involvement of PGI2 in the PEEP-induced decreases in CO and BP. Chloralose-anesthetized mechanically ventilated dogs were subjected to brief intervals (75 s) of PEEP 10 or 20 mm Hg. Arterial levels of 6-keto-PGF1a (stable metabolite of PGI2) were monitored by radioimmunoassay. These parameters were compared before and during PEEP application. During PEEP, tracheal pressure-related decreases in both CO and BP were noted. Application of either PEEP 10 or 20 mm Hg resulted in an increase in circulating 6-keto-PGF1a levels in three animals while a decrease was noted in two others. Overall, application of PEEP did not result in a significant change from baseline levels. Furthermore, there was no correlation between changes in either CO or BP with changes in arterial 6-keto-PGF1a levels. These results do not support the hypothesis that the short term PEEP-induced changes in CO or BP are mediated by endogenously released PGI2. Author

A86-44092
LOW BACK PAIN IN PILOTS
P. FROOM, J. BARZILAY, Y. CAINE, S. MARGALIOT, D. FORECAST (Israel Air Force, Aeromedical Center, Ramat Gan) et al. Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 694, 695. refs

A questionnaire on low back pain (LBP) was administered to 373 fighter pilots, 165 transport pilots, and 264 helicopter pilots. Helicopter pilots had more pain during flight than did fighter or transport pilots (34.5, 12.9, and 5.1 percent, respectively). A history of LBP temporally unassociated with flight was found in 26.5 percent of helicopter pilots, 31.5 percent of transport pilots, and 25.2 percent of fighter pilots. It is concluded that, despite the pain experienced by helicopter pilots in flight, they are not at increased risk for LBP unassociated with flight. Author

A86-44093
DIFFUSE PULMONARY OSSIFICATION AND SPONTANEOUS PNEUMOTHORAX IN A PILOT - A CASE REPORT
P. F. EKHOLDT, B. R. OPPEDAL, and P. ARVA (National Hospital; Luftfartsverket, Oslo, Norway) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 696-698. refs

A86-44095
THE SIGNIFICANCE OF RECURRENT CHILDHOOD RESPIRATORY DISORDERS IN FLIGHT TRAINING APPLICANTS
M. FELDMAN, P. FROOM, Y. CAINE, S. MARGALIOT, and J. BENBASSAT (Israel Air Force, Aeromedical Center, Ramat Gan; Hadassah University Hospital, Jerusalem) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 706-708. refs

A random sample of 1700 18-year-old applicants for flight training, who had been free from respiratory symptoms for one year or more was screened for respiratory symptoms in the past. Those who denied such a history had a questionnaire sent to their parents for further verification. Altogether 70 subjects with a past history of 'wheezing', 'asthma', or 'spastic bronchitis' were thus identified. Abnormalities in either FEV1/FVC, Vmax50 or Vmax75 were found in 40 percent of the subjects with a history of childhood 'wheezing', 'asthma', or 'spastic bronchitis', but only

in 8 percent of controls without such a history. A history of wheezing had no effect on the residual volume/total lung capacity ratio. The age at which the last bout had occurred had no apparent effect on the degree of flow abnormalities. The most sensitive index for a flow abnormality was Vmax50, which was less than 74 percent of the predicted values in 2/(30 percent) of the 70 subjects tested. It is concluded that, in subjects with a history of 'wheezing', 'asthma', or 'spastic bronchitis', flow abnormalities may persist even after prolonged remissions. Author

A86-44096
PHYSICAL TRAINING AND +GZ TOLERANCE REEVALUATED
R. BULBULIAN (Kansas State University of Agriculture and Applied Science, Manhattan) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 709-711. refs

The effect of physical training on +Gz tolerance is of vital interest in the aerospace community. The data on the effect of physical training on orthostatic tolerance or simulated air combat maneuvers is equivocal. The effects of aerobic and strength training programs is briefly reviewed. The data suggest a need for careful reinterpretation of research results in light of conflicting reports and methodological shortcomings. Aerobic training cannot be assumed to always be detrimental nor can strength training be assumed to be universally effective in improving +Gz tolerance. In selecting appropriate screening criteria and training regimens for aircraft personnel, it seems prudent to reinvestigate strength and endurance training effects on +Gz tolerance using multivariate research paradigms. Special attention should be directed to commonly accepted physiological principles which may vary under conditions of altered gravitation. Author

A86-44097
SIMULATED AERIAL COMBAT MANEUVERING TOLERANCE AND PHYSICAL CONDITIONING - CURRENT STATUS
R. R. BURTON (USAF, School of Aerospace Medicine, Brooks AFB, TX) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 712-714. refs

A86-44194
EFFECT OF HEAD-OUT WATER IMMERSION ON RESPONSE TO EXERCISE TRAINING
L. M. SHELDAHL, F. E. TRISTANI, P. S. CLIFFORD, J. H. KALBFLEISCH, and G. SMITS (USVA, Cardiopulmonary Rehabilitation Center, Wisconsin, University, Milwaukee) Journal of Applied Physiology (ISSN 0161-7567), vol. 60, June 1986, p. 1878-1881. Research supported by the Wisconsin Heart Association. refs
(Contract USVA-7876-01P)

During spaceflight and head-out water immersion (WI) there is a cephalad shift in blood volume. It has recently been shown that left ventricular end-diastolic dimension is significantly greater during moderate cycling exercise with WI compared with on land. The purpose of this study was to determine whether the cephalad shift in blood volume and accompanying increase in cardiac preload with WI alters the normal cardiovascular adaptations to aerobic exercise training. Nine middle-aged healthy men trained on cycle ergometers in water, nine trained on land, and four served as controls for 12 wk. Following training, both training groups showed similar increases (P less than 0.05) in stroke volume and similar decreases in heart rate (P less than 0.01) and blood pressure (P less than 0.05) at a given submaximal exercise O2 consumption. Maximal O2 consumption increased (P less than 0.01) similarly for both training groups. The control group did not demonstrate any significant changes in submaximal or maximal exercise responses. It is concluded that the cephalad shift in blood volume with WI does not alter the normal cardiovascular adaptation to aerobic exercise training. Author

A86-44778
HUMAN FACTORS PROBLEMS IN THE TACTICAL AIR COMMAND
R. M. DEHART (USAF, Tactical Air Command, Langley AFB, VA) SAFE Journal, vol. 16, no. 2, Summer 1986, p. 18-20.

The increase in human-factor (HF) variable mishaps to 60-70 percent of the USAF aircraft mishaps in 1984 and 1985 is discussed. The most important HF problems are accelerative force problems, particularly spatial disorientation (SD) and high-G loss of consciousness. SD mishaps account for 30 percent of the F-16 HF mishaps and 19 percent of the F-15 and F-4 HF mishaps. Current medical screening policies to minimize high-G mishaps include coronary artery risk evaluations and hyperlipemia selection standards. High-G fighter pilot training is also being implemented. R.R.

A86-44780
INFLIGHT LOSS OF CONSCIOUSNESS - A FIRST LOOK AT THE U.S. NAVY EXPERIENCE
D. C. JOHANSON (U.S. Navy, Naval Weapons Center, China Lake, CA), H. T. PHEENY (U.S. Navy, Naval Air Systems Command, Washington, DC), J. F. PALMER (U.S. Navy, Pacific Missile Test Center, Point Mugu, CA), and R. A. MATTHEWS (U.S. Navy, Naval Hospital, Rota, Spain) SAFE Journal, vol. 16, no. 2, Summer 1986, p. 30-35. Navy-sponsored research.

This paper represents the first public release of a recent NAVAIR-sponsored survey studying the incidence of in-flight acceleration (g) induced loss of consciousness (GLOC) in the United States Navy. The survey provides some valuable information on aviator attitudes, practices, and performance, in addition to suggesting the requirement for a follow-up study. The survey indicated a 12 percent incidence of GLOC within the Navy, which is in agreement with the findings of the Air Force study of two years previous which also indicated a rate of 12 percent for that service. The primary goal of this survey was to determine the relative incidence of GLOC. However, in the process, the survey examined a number of items of potential interest to the life support systems designer which may prove beneficial to future designs. In addition to discussing the primary goal, this report looks at several areas of potential interest with respect to the life support aspects of the flight environment. Author

A86-44814
G-INDUCED LOSS OF CONSCIOUSNESS - COMBAT AIRCRAFT PILOTS HEAD FOR TROUBLE
G. CHAMBOST and P. TURK Interavia (ISSN 0020-5168), vol. 41, May 1986, p. 507, 508.

The problem is examined of modern combat aircraft being able to sustain G forces greater than their pilots can tolerate and remain conscious. Between 1983 and 1984, the U.S. Air Force officially acknowledged nine accidents in which loss of consciousness under high G loads was deemed to have been the primary cause. An aircraft such as the F-16 or Mirage 2000 can not only maintain loads of 9G for several tens of seconds but can also reach these high values in only a few seconds; the body has no time to organize its automatic defense mechanisms such as accelerated heart rate and increased blood pressure. Studies at the Air Force School of Aerospace Medicine indicate that the ability of the cardiovascular system to maintain correct irrigation of the brain is inversely proportional to the rate of onset of G forces; this is why the problem is so serious in high performance combat aircraft. Techniques for dealing with the problem (inclined crew seats, G suits) are considered. The G-LOC (G-induced loss-of-consciousness) problem has been shrouded in mystery in part because of a knowledge of how far one has pushed back the limits of G tolerance is of great interest to an adversary. D.H.

A86-45254*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
FLUID DYNAMIC STUDY IN A FEMORAL ARTERY BRANCH CASTING OF MAN WITH UPSTREAM MAIN LUMEN CURVATURE FOR STEADY FLOW
Y. I. CHO, L. H. BACK (California Institute of Technology, Jet Propulsion Laboratory, Pasadena), and M. R. BACK ASME, Transactions, Journal of Biomechanical Engineering, vol. 107, Aug. 1985, p. 240-248. NASA-supported research. refs
(Contract NIH-HL-23619-05)

An in-vitro, steady flow investigation was conducted in a hollow, transparent vascular replica of the profunda femoris branch of man for a range of physiological flow conditions. The replica casting tested was obtained from a human cadaver and indicated some plague formation along the main lumen and branch. The flow visualization observations and measured pressure distributions indicated the highly three-dimensional flow characteristics with arterial curvature and branching, and the important role of centrifugal effects in fluid transport mechanisms. Author

A86-45325
THE EFFECT OF HIGH TEMPERATURE ON THE HEAT EXCHANGE AND THE NUTRITIONAL STATUS OF PILOTS [VLIIANIE VYSOKOI TEMPERATURY NA TEPLOOBMEN I SOSTOIANIE PITANIIA U LETCHIKOV]
A. N. AZHAEV, V. E. POTKIN, P. A. LOZINSKII, and V. A. EFIMOV Voenno-Meditsinskii Zhurnal (ISSN 0026-9050), April 1986, p. 39-41. In Russian. refs

Changes in body mass, pulse rate, oral and average skin temperatures, urine volume, and mineral excretion were studied in pilots after flights from moderate climatic zones into zones with higher (by 15 to 20 C) temperatures. In addition, caloric and liquid intakes of the subjects were correlated with their objective evaluation of appetite and thirst, efficiency, and the state of well being. Compared with psychophysiological changes registered in the same pilots after flights within moderate climatic zones, flights into a hotter zone were accompanied by large increases of pulse rate and by other unfavorable changes of the analyzed psychophysiological indices. It is recommended that pilots designated for flights from a moderate into a hot temperature zone be screened on the basis of clinical and physiological tests, and that prophylactic measures be taken against dehydration and overheating of the organism before, during, and after the flight. I.S.

A86-46270
RADIOFREQUENCIES AND MICROWAVES - RADIATION SAFETY OF THE OPERATOR [RADIOIZLUCHENIIA I MIKROVOLNY - RADIATSIONNAIA BEZOPASNOST' OPERATORA]
B. I. DAVYDOV Kosmicheskie Issledovaniia (ISSN 0023-4206), vol. 24, May-June 1986, p. 459-465. In Russian. refs

The radiofrequency and microwave radiation safety standards existing in the USSR, Poland, Czechoslovakia, USA, Canada, Great Britain, and West Germany are examined along with the proposals of the IRPA/INIRC. It is noted that the dosimetric principle provides best results in evaluating biological effects but is associated with certain difficulties in interpretation; therefore the use of the effective dose as a criterion of biological effects is preferable. Some organizational aspects of radiation safety are discussed. V.L.

A86-46938#
AN UPDATED MODEL FOR A SPACE STATION HEALTH MAINTENANCE FACILITY
W. T. HARVEY, S. M. FARRELL, A. J. HOWARD, and F. C. PEARLMAN (Lockheed Missiles and Space Co., Inc., Sunnyvale, CA) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 7 p.
(AIAA PAPER 86-2303)

The Space Station Health Maintenance Facility (HMF) is required to provide 'critical care' capability for one crew-nember for 28 days. The HMF must also provide routine monitoring and care for the Space Station crew for the duration of the mission. The equipment necessary to meet these requirements has been defined and an estimate of the physical characteristics of each piece of equipment has been completed. The equipment has been integrated into two Space Station standard outfitting packages, one which contains the laboratory and data management equipment and one which holds the critical care equipment and X-ray reader. The front panel configuration has been designed for optimum crew interface. The total system weight, volume and power requirements have been estimated at 1500 lbs, 140 cubic feet, and 0.5/2 kilowatts (routine/ critical care). The HMF Medical Data Management System hardware and architecture has been designed to complement the Space Station Data Management System. Author

N86-30303*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE TEMPORAL RESPONSE OF BONE TO UNLOADING
R. K. GLOBUS, D. D. BIKLE (California Univ., San Francisco.), and E. MOREY-HOLTON 19 Dec. 1984 34 p Prepared in cooperation with Veterans Administration Hospital, San Francisco, Calif.
(Contract NAGW-236)
(NASA-TM-89228; NAS 1.15:89228) Avail: NTIS HC A03/MF A01 CSCL 06P

Rats were suspended by their tails with the forelimbs bearing the weight load to simulate the weightlessness of space flight. Growth in bone mass ceased by 1 week in the hindlimbs and lumbar vertebrae in growing rats, while growth in the forelimbs and cervical vertebrae remained unaffected. The effects of selective skeletal unloading on bone formation during 2 weeks of suspension was investigated using radio iostope incorporation (with Ca-45 and H-3 proline) and histomorphometry (with tetracycline labeling). The results of these studies were confirmed by histomorphometric measurements of bone formation using triple tetracycline labeling. This model of simulated weightlessness results in an initial inhibition of bone formation in the unloaded bones. This temporary cessation of bone formation is followed in the accretion of bone mass, which then resumes at a normal rate by 14 days, despite continued skeletal unloading. This cycle of inhibition and resumption of bone formation has profound implication for understanding bone dynamics durng space flight, immobilization, or bed rest and offers an opportunity to study the hormonal and mechanical factors that regulate bone formation. B.G.

N86-30304# Army Research Inst. of Environmental Medicine, Natick, Mass.
THERMOREGULATION AFTER ATROPINE AND PRALIDOXIME ADMINISTRATION
M. A. KOLKA, L. A. STEPHENSON, S. P. BRUTTIG, B. S. CADARETTE, and R. R. GONZALEZ Mar. 1986 19 p
(AD-A165868) Avail: NTIS HC A02/MF A01 CSCL 06O

The effects of intramuscular saline (control), atropine (2mg), pralidoxime (600 mg) or a combination of the two drugs on heat exchange was evaluated in four healthy males during moderately intense seated, cycle exercise (55% v02 peak) in a temperate environment (T sub a = 30.3 C, P sub W = 1.0 kPa). Esophageal, rectal, and mean skin temperatures, and chest and forearm sweating were continuously measured. Skin blood flow (FBF) from the forearm was measured twice each minute by venous occulusion plethysmography. Whole body sweating was calculated from weight changes. The expected result of atropine injection, decreased eccrine sweating (-60%, P 0.05) with ensuent elevated esophageal (+0.4C, $P<0.05$) and skin temperature (+2.1C, $P<0.05$) was observed relative to control. Heart rate (+28 b/min) and FBF (+9 ml/100cc) were higher after atropine. Pralidoxime, in general, did not affect the core and skin temperature responses to the exercise differently from control; however, a slightly elevated FBF (+3ml/100cc min, 33%) compensated for the reduction in whole body sweating (-45%, $p<0.05$) that we observed. The combination of the drugs resulted in significantly higher esophageal (0.4C) and skin (0.9C) temperatures than atropine alone, as has been previously shown. The thermoregulatory disadvamtage of inhibited sweating by atropine was partially compensated for by enhanced

skin blood flow in this environment where T sub a>T sub sk. Pralidoxime was shown to decrease whole body sweating, by a mechanism as yet unexplained. GRA

N86-30305# Army Research Inst. of Environmental Medicine, Natick, Mass.
HUMAN VASCULAR FLUID RESPONSES TO COLD STRESS ARE NOT ALTERED BY COLD ACCLIMATION
A. J. YOUNG, S. R. MUZA, M. N. SAWKA, and K. B. PANDOLF Mar. 1986 26 p
(AD-A165869; USARIEM-M-19/86) Avail: NTIS HC A03/MF A01 CSCL 06S

Repeated cold water immersion can induce the development of an insulative type of cold acclimation in man. This investigation determined if repeated cold water immersion produced changes in vascular fluid response to cold stress in addition to the previously reported changes in thermoregulation. Seven male subjects performed a standardized cold air and cold water exposure before and again after a cold acclimation program. The cold acclimation program consisted of daily immersion (90 min) in cold water (18 C, stirred) repeated five times per week for five consecutive weeks. Cold acclimation did not alter the responses of plasma volume or electrolyte concentrations, nor urinary flow or electrolyte excretion during either cold air or cold water exposure. The percent reduction in plasma volume was larger ($P<0.01$) in cold water (-17%) than in cold air (-12%). Cold water immersion resulted in greater ($P<0.01$) diuresis than cold air exposure. Plasma K(+) concentration increased ($P<0.01$) during cold (both air and water) exposure while plasma Na(+) concentration was unchanged. Calculated renal clearance and urinary excretion rate of both Na(+) and K(+) increased during cold (both air and water) exposure. It is concluded that: (1)insulative cold acclimation does not influence vascular fluid responses to cold stress; and (2)although vascular fluid shifts, body cooling and diuresis are all greater in cold water than air, a consistent relationship among these parameters could not be established for an individual's response. GRA

N86-30306# Naval Submarine Medical Research Lab., Groton, Conn.
CALCIUM AND VITAMIN D METABOLISM IN SUBMARINERS: CARBON DIOXIDE, SUNLIGHT AND ABSORPTION CONSIDERATIONS
D. M. SACK, M. HOLICK, and K. R. BONDI 15 Jan. 1986 25 p
(AD-A166292; NSMRL-1037) Avail: NTIS HC A02/MF A01 CSCL 06P

A 42% decrease in 25(OH)vitamin D levels has been noted in subjects over the course of submarine patrols and is thought to be the result of prolonged sunlight deprivation. The influence of the submarine environment on absorption of ingested vitamin D has not been previously investigated. This study examines the vitamin D absorption patterns of 5 subjects at the beginning, middle, and end of a 69 day patrol on a normal diet and with no exposure to sunlight. It was found that the magnitude and pattern of absorption does not change appreciably. It is concluded that the absorption of vitamin D is not affected by the submarine environment and that any drop in 25(OH) vitamin D levels seen during patrol is caused by lack of sunlight, ultraviolet light in particular. Implications in terms of sunlight deprivation and calcium metabolism are discussed in a historical review of calcium and vitamin D investigations on submarines. GRA

N86-30307# Army Research Inst. of Environmental Medicine, Natick, Mass.
AN ENVIRONMENTALLY-CONTROLLED EXTENDED-USE SMALL ANIMAL HYPOBARIC CHAMBER
J. A. DEVINE and A. CYMERMAN Apr. 1986 14 p
(AD-A166729; USARIEM-M-23/86) Avail: NTIS HC A02/MF A01 CSCL 06S

An environmentally-controlled extended-use small animal hypobaric chamber has been designed to study small laboratory animals at low barometric pressures for long periods of exposure. The rectangular chamber (91.4 x 71.1 x 50.8 cm) is constructed of aluminum plate and acrylic resin with a volume of 330,000 cc. A computer/data acquisition control unit provides for controlling and collecting data on pressure, temperature, and relative humidity (RH) for sustained operations. Altitude simulation is achieved using a two-stage, air-cooled vacuum pump with a displacement of 30 cc/min. The pressure within the chamber is controlled by an incremental throttling valve in the vacuum line. Temperature (0-100 C) is accomplished by using a remote-controlled constant temperature circulating bath. RH (20-80%) is regulated by pre-conditioning the ventilation purge air prior to entering the chamber. Acceptable levels of oxygen and carbon dioxide gases are maintained by purging with sufficient volumes of fresh air. GRA

N86-30308# Argonne National Lab., Ill.
MULTIPARAMETER DATA ACQUISITION SYSTEMS FOR STUDIES OF CIRCADIAN RHYTHMS
K. R. GROH, C. F. EHRET, W. J. EISLER, JR., and D. A. LEBUIS 1985 15 p Presented at the NATO Advanced Workshop on Chronobiotechnology, Cardiff, Wales, 21 Apr. 1985
(Contract W-31-109-ENG-38)
(DE86-004041; CONF-8504206-1) Avail: NTIS HC A02/MF A01

Long-term, simultaneous monitoring of multiple metabolic circadian cycles such as energy metabolism, animal activity, and body temperature together have revealed ultradian fine-structure rhythms which are dependent on circadian phase and the perturbations of environmental influences. Because of the variation between individual animals, these experiments need to have large sample sizes for each experimental condition. To this end we have designed, constructed, and used four microcomputer controlled data acquisition systems to collect circadian data from individually housed rats and mice. DOE

N86-30309# Advisory Group for Aerospace Research and Development, Neuilly-Sur-Seine (France). Aerospace Medical Panel.
MEDICAL SELECTION AND PHYSIOLOGICAL TRAINING OF FUTURE FIGHTER AIRCREW
Loughton, England Dec. 1985 146 p refs In ENGLISH and FRENCH Conference held in Athens, Greece, 25-26 Apr. 1985
(AGARD-CP-396; ISBN-92-835-0385-6) Avail: NTIS H A07/MF A01

The conference proceedings reviewed and made recommendations with respect to the medical selection and physiological and physical training of pilots who are to operate future fighter aircraft. The relevant characteristics of a proposed USAF fighter and the European Fighter Aircraft were discussed and used as the basis for selection and training considerations. Contributors drew upon the experience of the medical selection of pilots for present fighter aircraft. The cardiovascular, vision, and vertebral column aspects of medical selection and monitoring are considered in depth and recommendations made as to the methods which should be employed in the future. The influence of physical fitness upon pilot performance is addressed. The philosophy and practice of physiological training of aircrews is reviewed with emphasis on the value of the human centrifuge in teaching G protective maneuvers.

N86-30310# Air Force Wright Aeronautical Labs., Wright-Patterson AFB, Ohio.
AIRCREW ASPECTS OF UNITED STATED FUTURE FIGHTER AIRCRAFT
R. D. KROBUSEK *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 5 p Dec. 1985
Avail: NTIS HC A07/MF A01

The cockpit environment of fighter aircraft for the year 2000 and beyond will undoubtedly need aircraft technologies and protective devices to meet the ever growing enemy challenge. Recent advances in aircraft structures, flight controls, sensors, multipurpose and touch-sensitive displays, voice recognition and synthesis, enemy defenses, and chemical/biological warfare (CBW) technologies will combine to create a cockpit environment for future fighter aircraft vastly different and potentially more complex than any previously encountered by aircrews. This integration of

equipment and crewmembers will interact such that new stresses will be created and existing ones aggravated. Special maneuver capability through the use of direct side force may provide significant tactical advantage at the expense of stress due to lateral acceleration forces. A few of these current technoloies and some of the driving forces which will affect the cockpit environment of tomorrow's aircraft will be identified and discussed briefly. These technologies, as well as others, should receive further study for their effects on the aircrew prior to application in future aircraft. Proper application of the results of these studies will prevent the unbridled growth of cockpit complexity. Author

N86-30311# Defence and Civil Inst. of Environmental Medicine, Downsview (Ontario).
CANADIAN FORCES APPROACH TO AIRCREW MEDICAL SELECTION
G. GRAY *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 6 p Dec. 1985
Avail: NTIS HC A07/MF A01

With advances in aircraft performance capabilities and in medical screening technology, major changes in Canadian Forces aircrew medical screening procedures were proposed and are being introduced. In addition to the standard battery of tests, additional screening procedures being introduced or evaluated include drug screening for cannabinoids, contrast sensitivity function visual assessment, echocardiograms, cardiovascular risk assessment, pulmonary function testing, an aeromedical history questionnaire, and a psychosocial and clinical review by a flight surgeon. Screening electroencephalograms are being continued. This data is used to reject candidates who fail to meet slection standards, and to provide a Medical Suitabiliyt Rating for acceptable candidates. Of candidates screened 2.8% had positive tests for urinary cannabinoids. Contrast sensitivity norms for the aircrew candidate population are higher than for other populations studied. Contrast sensitivity may be helpful in assessing candidates whose vision is close to standards. This approach to initial medical screening should reduce attrition of experienced aircrew for medical reasons, and will enhance flight safety over the years to come.
Author

N86-30312# Tactical Air Command, Langley AFB, Va.
MEDICAL SELECTION AND PHYSIOLOGICAL TRAINING OF FIGHTER PILOTS: A 1985 PERSPECTIVE AND OVERVIEW
R. M. DEHART *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 5 p Dec. 1985
Avail: NTIS HC A07/MF A01

From an aeromedical perspective, there are two major goals for the Tactical Air Force. The first is to reduce the aircraft mishap rate due to human factor variables. The second is to enchance pilot capability to perform in the modern fighter environment. Fighter pilots can perform in the 9G (sub z) environment effectively and safely if they are properly selected, educated, and trained. In addition to being good aviators, smart, and aggressive, fighter pilots must be physically healthy and in excellent physical condition. A thorough understanding of high-G physiology and the personal physiological flight envelope is needed. Accomplishing the variety of initiatives required to realize these goals is an exciting challenge for the aerospace medical community. Author

N86-30313# School of Aerospace Medicine, Brooks AFB, Tex.
CARDIOVASCULAR STANDARDS FOR SELECTION AND RETENTION OF HIGH PERFORMANCE PILOTS IN THE USAF: PERSPECTIVES FOR THE NEXT DECADE
J. R. HICKMAN, JR., G. M. MCGRANAHAN, JR., R. M. PAULL, and R. M. DEHART (Tactical Air Command, Langley AFB, Va.) *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 7 p Dec. 1985
Avail: NTIS HC A07/MF A01

Cardiovascular selection and retention standard must be based upon a number of considerations which are primarily epidemiological in nature. In young applicants, there is little rationale in the performance of expensive, labor intensive studies which yield nonspecific results, most of which are normal variants. Stress tests and Holter monitors fall into this category. Since the significance of nonspecific findings is determined by the presence or absence of underlying organic structural defects, it is recommended that testing in a young population be directed toward the detection of anatomical defects. It is also recommended that abnormal findings of a structural nature then be assessed with functional tests to determine whether the applicant may enter some form of aviation training or be disqualified from all training. B.G.

N86-30314# Centre Principal d'Expertises Medicales du Personnel Navigant de l'Aeronautique, Paris (France).
SELECTION AND MEDICAL TESTING OF MIRAGE 2000 PILOTS: REPORT OF ECHOCARDIOGRAPHY [SELECTION ET SURVEILLANCE MEDICALES DES PILOTES DE MIRAGE 2000: APPORT DE L'ECHOCARDIOGRAPHIE]
H. ILLE, A. DIDIER, N. ALLEGRINI, and C. MAUREL *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 13 p Dec. 1985 In FRENCH
Avail: NTIS HC A07/MF A01

The use of echocardiological examinations in the selection of prospective combat aircraft crews is discussed. Included is a comparative study of two homogeneous pilot cohorts; one consists of 34 transport aircraft pilots, and the other consists of 32 combat pilots. It is shown that the two cohorts present the same anomalies of the right cardiac region (mitral valvular prolapsus). However, it is shown that the anomalies of the right cardiac region form a right ventricular dilation only in combat pilots. Two hypotheses were developed: that the anomalies are an adaptation of the right cardiac region to accelerations, or that they are a stage preceeding secondary myocardial shock due to aeronautical constraints.
B.G.

N86-30315# Hopital d'Instruction des Armees, Versailles (France).
CONTINUOUS ECG MONITORING OF MIRAGE 2000 PILOTS (COMPARISON WITH MIRAGE 3 AND F1 PILOTS) [ENRIGISTREMENT CONTINU DE L'E.C.G. CHEZ LES PILOTES DE MIRAGE 2000 (COMPARAISON AVEC LES PILOTES DE MIRAGE 3 ET F1)]
A. SEIGNEURIC, G. LEGUAY, J. P. BURLATON, G. POYOT, and M. SYLVESTRE *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 3 p Dec. 1985 In FRENCH
Avail: NTIS HC A07/MF A01

Continuous Electrocardiographic monitoring for a duration of 24 hours allows a comparison of a sample of 24 conventional combat aircraft pilots (Mirage III and FI), with 7 Mirage 2000 pilots. A comparison of problems due to excitability during flight does not show signification differences among the two groups. Problems due to solar repolarization were recorded only for high-performance aircraft pilots. Differences primarily included cardiac frequencies in flight; they were clearly lower for the Mirage 2000 pilots as observed acceleration was increased. This corresponds with the differences in characteristics of the two populations, pertaining to the different missions. It is shown that modern combat aircraft, characterized by intense and prolonged acceleration, are capable of causing a certain excitability factor for the pilots. It is important to determine the influence of this acceleration on the cardiovascular system. B.G.

N86-30316# Centre d'Essais en Vol, Bretigny-sur-Orge (France).
THE USE OF ECG CHANGES CAUSED BY ACCELERATION AS TOLERANCE PREDICITION FACTORS [LES MODIFICATIONS ELECTROCARDIOGRAPHIQUES INDUITES PAR LES ACCELERATIONS, FACTEUR PREDICTIF DE LA TOLERANCE]
J. H. CLERE, H. VIELLEFORD, and J. L. POIRIER *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 7 p Dec. 1985 In FRENCH
Avail: NTIS HC A07/MF A01

High-G accelerations experienced by combat aircraft pilots are arythmogenic. Of 328 electrocardiographic (EKG) tests done on

146 subjects submitting to accelerations of 4 to 11 G at a duration of 20 to 60 seconds, 215 supraventricular anomalies were observed on 181 tests, and 37 ventricular anomalies were observed on 31 tests. The frequency of these anomalies are a function of the intensity of the acceleration. However, there appeared to be no correlation between the EKG anomalies and the hemodynamic phenomena caused by problems of visual function or psychomotor problems. Thus it is stated that EKG monitoring may be of interest for use as a prediction factor for acceleration tolerance. It is stated that the anomalies of rhythm are probably based on vagus reflexes caused by attempts by the heart to protect against the acceleration, as well as by the venous responses to the centrifuge. B.G.

N86-30317# Royal Air Force Inst. of Aviation Medicine, Farnborough (England).

ENTRY VISUAL STANDARDS AND OCULAR EXAMINATION TECHNIQUES FOR FUTURE FIGHTER AIRCREW

D. H. BRENNAN *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 6 p Dec. 1985

Avail: NTIS HC A07/MF A01

The visual tasks of future fighter aircrew are likely to increase both in magnitude and complexity. The increasing adoption of devices for visual enhancement and protection, even now, poses problems for integration with spectacles. The visual standards required for initial selection for training as a pilot or navigator should, if numbers permit, be such that trained aircrew are unlikely to require a visual aid until presbyopia physiologically demands correction in the latter half of the fourth decade. The visual standards considered appropriate for future fighter aircrew and the related ocular examination techniques both conventional and those designed to test such specialized ocular functions as stereopsis, glare resistance, dark adaptation, hue discrimination, and modulation transfer function are discussed. Author

N86-30318# Centre d'Etudes et de Recherches de Medecine Aerospatiale, Paris (France).

SENSITIVITY TO COLOR CONTRASTS AND THE SELECTION OF NAVIGATOR PERSONNEL [SENSIBILITE AU CONTRASTE EN COULEURS ET SELECTION DU PERSONNEL NAVIGANT]

J. P. MENU, G. SANTUCCI, and C. CORBE *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 8 p Dec. 1985 In FRENCH

Avail: NTIS HC A07/MF A01

Using a specific psychophysical method, the sensitivity to color contrasts (FSC) was systematically tested for subjects undergoing ophthalmological examinations. Following FSC examinations, several subjects with ametrophic conditions were studied. The FSC examinations were modified to obtain the exact nature of the ophthalmological l problem. It is shown that there is a change in the spatial frequencies of the blue section for subjects with myopic disorders, and a change in the red section for far-sighted subjects. This change is shown to be proportional to the degree of ametrophic disorder. Thus, FSC tests are proposed as a basis for tests for the selection of navigators. B.G.

N86-30319# School of Aerospace Medicine, Brooks AFB, Tex. Neurosciences Function.

COMPUTER ANALYSIS OF VISUAL AND VESTIBULAR OCULOMOTOR FUNCTION IN THE MEDICAL SELECTION OF FIGHTER AIRCREW MEMBERS

J. W. WOLFE, E. J. ENGELKEN, and K. STEVENS, W. *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 6 p Dec. 1985

Avail: NTIS HC A07/MF A01

Methods for evaluating visual and vestibular-oculomotor function in aircrew members are reviewed. Three specific tests are described: pursuit tracking, harmonic angular acceleration, and saccadic tracking. In all of these tests, on-line computer analysis is used to quantify and describe the input/output relationships. An example of clinical data from pursuit tracking and harmonic angular acceleration tests for a patient with known pathology are used to demonstrate changes in test results. The major point is that it is now practical to evaluate oculomotor function in pilots and aircrew members selected for fighter aircraft duty. Author

N86-30320# Naval Aerospace Medical Research Lab., Pensacola, Fla.

VISUAL CAPABILITIES RELATED TO FIGHTER AIRCREW PERFORMANCE IN THE F-14 AND ADVERSARY AIRCRAFT

W. A. MONACO and P. V. HAMILTON *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 9 p Dec. 1985

Avail: NTIS HC A07/MF A01

Standards for aviation personnel should be based on capacities for performing critical tasks. The use of scores on task-relevant visual tests to predict air-to-air target detection performance of pilots involved in air combat maneuver (ACM) training was determined. A series of automated vision tests was determined in a mobile field laboratory located at a Tactical Air Combat Training System (TACTS) range. A computerized telemetry network provides extensive real time data on observer and target aircraft flight dynamics, and environmental parameters. A pilot's performance on each ACM engagement was measured by the slant range at the instant he sighted a target aircraft. Priminary analyses show that about 30% of the variance in the slant range is accounted for by flight dynamics, and environmental parameter, and vision data. Author

N86-30321# Naval Aerospace Medical Research Lab., Pensacola, Fla.

VISION TEST BATTERY THRESHOLD AND RESPONSE TIME AS PREDICTORS OF AIR-TO-AIR VISUAL TARGET ACQUISITION IN F-14 AND ADVERSARY AIRCRAFT

A. MORRIS, P. V. HAMILTON, W. A. MOREY, and R. P. BRIGGS (University of Southern California, Los Angeles.) *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 8 p Dec. 1985

Avail: NTIS HC A07/MF A01

The Naval Aerospace Medical Research Laboratory (NAMRL) Vision Test Battery provides assessment of various visual functions, including spot detection, acuity at high and low contrast, glare sensitivity, and accommodative flexibility. Within these tests are measures of threshol, threshold-stressed response time (for near-threshold stimuli), and unconfounded response time (for supra-threshold stimuli). The contribution of response time variables to predicting flight performance was evaluated for 73 fighter pilots. Vision test data were compared to performance in air combat maneuver training. The distance (slant range) between the observer and target aircraft at time of initial visual detection was used as the performance variable. Availability of response time variables enhanced the ability to predict the air-to-air visual target detection performance of these pilots. Four vision variables accounted for about 32% of the variance in performance of those pilots who detected target aircraft. at slant ranges greater than the group average. Prediction of performance is improved by incorporating other vision data and additional refinement of the performance measure. Author

N86-30322# Hopital d'Instruction des Armees, Paris (France).

THE VERTEBRAL COLUMN: SELECTION AND APTITUDE OF COMBAT AIRCRAFT PILOTS OF THE FUTURE [COLONNE VERTEBRALE: SELECTION ET APTITUDE DES PILOTES D'AVION DE COMBAT DU FUTUR]

P. J. METGES, J. FLAGEAT, R. AUFRET, R. P. DELAHAYE, and H. VIEILLEFOND *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 3 p Dec. 1985 In FRENCH

Avail: NTIS HC A07/MF A01

The new generation of combat aircraft is characterized by the possibility of negative effects on the vertebral column due to extended or peak acceleration forces. In order to provide the pilot with optimal capacity for visual information assimilation, the cervical rachis must remain mobile and is therfore vulnerable under certain circumstances. Lesions may occur in this area during flight. Prevention of this condition is based on three elements: extensive

radiological examination of the rachis for pilot applicants; technical improvements in helmet alignment; and physical adaptation training. B.G.

N86-30323# Militair Hospitaal Dr. A. Mathijsen, Utrecht (Netherlands).
SYSTEMATIC RADIOGRAPHIC EXAMINATION OF THE SPINE FOR SELECTION OF F-16 PILOTS: A PRELIMINARY REPORT
A. VANDALEN and H. H. M. VANDENBIGGELAAR (Royal Netherlands Air Force, Soesterberg.) *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 4 p Dec. 1985
Avail: NTIS HC A07/MF A01

With the introduction of the high performance aircraft F-16 in the Royal Netherlands Air Force an increase in spinal column disorders was anticipated. Therefore, a systematic whole spine radiography of candidate student pilots (CSPs) and qualified pilots (QPs) designated to fly F-16 were performed since December 1982. To reduce radiation exposure radiographs were made using a modern 14 inch intensifier. So far, 225 CSPs and 196 QPs were examined. Strict application of the medical criteria leads to a rejection of 20% of the CSPs because of spinal disorders visualized on X-ray. For F-16 pilots, the major region of interest seems to be the cervical spine. The rejection rate could be reduced by readjustment of the medical criteria and separate selection of helicopter and fighter pilots. Systematic examination of QPs who had no or incomplete previous examinations uncovers a high rate of spinal disorders. In the series QPs without any symptoms were only rejected because of cervical discopathy with osteophyte formation on the backside of the vertebrae and resulting narrowing of the spinal canal. Author

N86-30324# CEAM, Mont-de-Marsan (France).
PHYSICAL TRAINING OF MIRAGE 2000 PILOTS [ENTRAINEMENT PHYSIQUE DES PILOTES DE MIRAGE 2000]
G. POYOT, J. M. CLERE, J. LEMOT, and J. P. DELATTRE *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 5 p Dec. 1985 In FRENCH
Avail: NTIS HC A07/MF A01

Nine combat aircraft pilots underwent physical training specifically designed to increase their tolerance to acceleration forces. The suitability of the training was studied using centrifuge tests. The increase in tolerance could be attributed to the effects of the physical training or to an adaptation to the centrifuge. It is shown that together with an excellent original physical condition, specific physical training may increase the tolerance of acceleration forces. Further testing of this is expected. B.G.

N86-30325# Belgian Air Force, Brussels.
TREADMILL SPIROERGOMETRY IN THE SELECTION AND SCREENING OF HIGH-PERFORMANCE COMBAT AIRCRAFT PILOTS IN THE BELIGAN AIR FORCE [SPIROERGOMETRIE SUR TAPIS ROULANT DANS LA SELECTION ET LA SURVEILLANCE DES PILOTES D'AVIONS A HAUTES PERFORMANCES DE LA FORCE AERIENNE BELGE]
G. PIRQUIN, J. VASTESAEGER, and P. VANDENBOSCH *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 5 p Dec. 1985 In FRENCH
Avail: NTIS HC A07/MF A01

All pilots of the Belgian Air Force who were designated for conversion to the F-16 aircraft underwent cardiovascular and respiratory examinations. One of the tests was a test for maximum treadmill effort. In the first study, the results of the screening were combined with the results of tests conducted on a group of young candidate student pilots. The aerobic capacity of this population was then evaluated. The test sample included 156 persons of various ages and in different stages of physical conditioning. In the second study, the positive effects of physical training on the treadmill spiroergometric examination of a group of F-16 pilots were examined. B.G.

N86-30326# Naval Aerospace Medical Research Lab., Pensacola, Fla.
RELATIONSHIP OF CARDIOPULMONARY FITNESS TO FLIGHT PERFORMANCE IN TACTICAL AVIATION
G. R. BANTA and J. D. GRISSETT *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 11 p Dec. 1985
Avail: NTIS HC A07/MF A01

Current endeavors to identify whether cardiopulmonary fitness can positively influence flight performance in a tactical fighter community are discussed. Population analyses of experienced and student Naval aviators present evidence that the U. S. Navy aviation pilot community is in an above the average state of physical fitness with less than average coronary heart disease potential. Correlations found between cardiopulmonary fitness and psychophysiological responses that occur during simulated and/or actual flight operations present strong ecidence that flight performance could be favorably affected. Author

N86-30327# Naval Aerospace Medical Inst., Pensacola, Fla. Aviation Physiology Dept.
HYPOBARIC TRAINING OF FLIGHT PERSONNEL WITHOUT COMPROMISING QUALITY OF LIFE
D. M. HERRON *In* AGARD Medical Selection and Physiological Training of Future Fighter Aircrew 7 p Dec. 1985
Avail: NTIS HC A07/MF A01

The increased incidence in decompression sickness during physiology training among U. S. Navy aircrew personnel and medical attendants requires a search for alternative means of permitting recognition and corrective action of hypoxia. The requirement for individual hypoxia training is considered valid not just by Navy regulations but by aeromedical practioners throughout the world. A proposal is made to utilize a gas mixture consisting of 7.4% oxygen and 92.6% nitrogen to induce hypoxia at ground level. This would permit ground level hypoxia training with similar symptoms of hypoxia as presently demonstrated at 25,000 feet in a decompresion chamber but would alleviate the primary cause of decompression sickness. All other U. S. Navy training objectives for the chamber exposure would be safely met and more efficiently demonstrated. The initial financial burden in modifying the existing decompression training chamber would be moderate when considering development and manufacturing of a new training device. The ultimate gain exists in decreased human suffering and the necessary return of credibility to the aeromedial training community. This is a must if we are to profess to do no harm.
Author

N86-31210# Systems Research Labs., Inc., Dayton, Ohio.
THE EFFECT OF BREATHING ELEVATED CO2 GAS MIXTURES ON TRACKING PERFORMANCE, BLOOD PRESSURE, AND SUBJECTIVE TOLERANCE AT 1GZ
T. G. SHRIVER, D. W. REPPERGER, J. W. FRAZIER, C. D. GOODYEAR, and L. D. TRIPP Mar. 1986 52 p
(Contract F33615-81-C-0500)
(AD-A165974; AAMRL-TR-86-006) Avail: NTIS HC A04/MF A01 CSCL 06S

The addition of small concentrations (5-10%) of carbon dioxide (CO2) to the breathing gas has been identified as a possible technique to increase Gz tolerance for pilots. Eight subjects participated in an experiment to examine tracking performance, physiological parameters, and subjective tolerance when breathing the four following gas mixtures: air; 100% O2; 2.5% CO2 and 97.5% O2; and 3.5% CO2 and 96.5% O2. Tracking performance was not significantly different when breathing any of these four gas mixtures. Learning, which continued to occur throughout the experiment, was inhibited when the subjects were breathing the 3.5% CO2 mixture. When using either of the CO2 mixtures there was a significant increase in relative respiratory volume and a modest increase in systolic (11 mm Hg) and diastolic (6 mm Hg) blood pressure. One subject, when breathing 3.5% CO2, aborted the run after 12 minutes because of air hunger. GRA

N86-31211# Army Research Inst. of Environmental Medicine, Natick, Mass.
METABOLIC CHANGES FOLLOWING ECCENTRIC EXERCISE IN TRAINED AND UNTRAINED MEN
W. J. EVANS, C. N. MEREDITH, J. G. CANNON, C. A. DINARELLO, and W. R. FRONTERA 1986 24 p
(AD-A166521; AD-E900544; USARIEM-M-20/86) Avail: NTIS HC A02/MF A01 CSCL 06P

The effects of one 45 minute bout of high intensity eccentric exercise (250 Watts) were studied in 4 male runners and 5 untrained men. Plasma creatine kinase (CK) activity in these runners was high ($p < 0.001$) than in the untrained men before exercise and peaked at 207 IU/ml one day after exercise, while in untrained men the maximum was 2143 IU/ml five days after exercise. Plasma interleukin-1 (IL-1) in the trained men was also higher ($p < 0.001$) than in the untrained men before exercise but did not significantly increase after exercise. In the untrained men, IL-1 was significantly elevated 3 hours after exercise ($p < 0.001$). In the untrained group only, 24-hour urines were collected before and after exercise while the men consumed a meat-free diet. Urinary 3-methyl-histidine/creatinine in the untrained group rose significantly from 126 umol/g before exercise to 180 umol/g ten days after exercise. The results suggest that in untrained men, eccentric exercise leads to a metabolic response indicative of delayed muscle damage. Regularly performed long distance running was associated with chronically elevated plasma IL-1 levels and serum CK activities without acute increases after an eccentric exercise bout. GRA

N86-31212# Army Research Inst. of Environmental Medicine, Natick, Mass.
INDUCED ERYTHROCYTHEMIA AND MAXIMAL AEROBIC POWER: AN EXAMINATION OF MODIFYING FACTORS
M. N. SAWKA, A. J. YOUNG, S. R. MUZA, R. R. GONZALEZ, and K. B. PANDOLF Apr. 1986 23 p
(AD-A166522; AD-E900544; USARIEM-M-22/86) Avail: NTIS HC A02/MF A01 CSCL 06E

Induced erythrocythemia is associated with an increase in maximal oxygen uptake. Two factors which might influence inter-subject variability for this increase in maximal oxygen uptake are the magnitude of change in hemoglobin concentration and the individual's initial aerobic fitness. To examine these factors, we have obtained and combined individual data from our own research and three other studies which employed similar procedures. In each study freeze-preserved erythrocytes representing the product of two blood units were reinfused and maximal oxygen uptake was measured within 24 to 72-h after reinfusion. The 30 subjects had an initial aerobic power which ranged from 36 to 88 ml 02/dg/min. The combined results from these studies indicate that after erythrocyte reinfusion: 1) the increase in hemoglobin concentration is fairly homogeneous; 2) nearly all individuals demonstrate an increase in maximal oxygen uptake; 3) the magnitude of increase in hemoglobin concentration is not related to the magnitude of increase in maximal oxygen uptake is related to the individual's initial aerobic fitness. Individuals with an initial aerobic fitness between 50 to 64ml O2/kg/min experience approximately twice the increase in maximal oxygen uptake after erythrocyte reinfusion compared to individuals with lesser or greater fitness. GRA

N86-31213# Army Research Inst. of Environmental Medicine, Natick, Mass.
INTRINSIC ALTERATION OF THE REACTIVE PROPERTIES OF ARTERIES DURING HYPOTHERMIA
N. R. BANDICK and D. E. ROBERTS 21 Mar. 1986 23 p
(AD-A166523; AD-E900544; USARIEM-M-21/86) Avail: NTIS HC A02/MF A01 CSCL 06E

This study compared the reactive and contractile properties of helical strips of femoral arteries taken from normothermic rabbits and rabbits that were anesthetized with pentobarbitol and cooled to 25 C at a rate of 7 C per hour. The purpose of this comparison was to see if intrinsic factors would alter the sensitivity and/or contractility of this vascular muscle to norepinephrine during whole body hypothermia. We found that, after two hours of in vivo hypothermia, the hypothermic derived tissue was from 10 to 100 times more sensitive to norepinephrine than the normothermic derived tissue. This augmented sensitivity continued while the tissue was in vitro for at least twelve hours. The dose-response curves of the hypothermic derived arteries were shifted to the left of the normothermic arteries resulting in a greater contractility at lower levels of agonist. Moreover, the normothermic tissue contracted slower than the hypothermic. The maximal tension developed by the strips was equivalent. This study has identified prolonged alterations of receptor sensitivities and contractility properties attributable to in vivo influences that can, in part, explain the disruptions of blood pressure during and following whold body hypothermia. GRA

N86-31214# Air Force Occupational and Environmental Health Lab., Brooks AFB, Tex.
ASSESSING POSSIBLE DAMAGE DUE TO RADIO FREQUENCY RADIATION Final Report
B. J. POITRAST Feb. 1986 13 p
(AD-A166913; OEHL-86-020C0111BRA) Avail: NTIS HC A02/MF A01 CSCL 06R

This report is written in response to requests from the field for guidance in the clinical examination of radio frequency radiation exposures. The report contains basic information on radio frequency radiation and its biological interactions. It also contains a suggested history and physical examination, a list of expected clinical findings, and suggestions for referral if necessary. GRA

N86-31215# Pacific Northwest Labs., Richland, Wash.
PHYSICAL INTERACTION OF HUMANS AND ANIMALS WITH POWER-FREQUENCY ELECTRIC AND MAGNETIC FIELDS
W. T. KAUNE Feb. 1986 11 p Presented at the IEEE Power Engineering Society Winter Meeting, New York, N.Y., 2 Feb. 1986 (Contract DE-AC06-76RL-01830)
(DE86-007734; PNL-SA-13716; CONF-860210-3) Avail: NTIS HC A02/MF A01

Research has been underway for more than 15 years investigating the biological and physical interactions of power-frequency electric fields coupled to humans and animals through the air dielectric around electric-power facilities. Currently, fairly detailed analyses can be made for homogeneous human- and animal-shaped models standing on ground while exposed to a vertical electric field. Some data are available for ungrounded exposure conditions. However, little is known about the effects of the nonuniform electrical properties of living tissues on induced-current distributions. Recently, interest has also developed in the interaction of humans and animals with power-frequency magnetic fields. Little data are available, and only simple estimates, using homogeneous ellipsodial models, can be made at present. Relatively simple calculational techniques are available, however, to analyze two- and three-dimensional models of humans and animals, and it can be expected that considerable progress will be made in the next few years. DOE

N86-31426*# Texas A&M Univ., College Station. Dept. of Biomedical Engineering.
ANALYSIS OF NYSTAGMUS RESPONSE TO A PSEUDORANDOM VELOCITY INPUT
C. S. LESSARD *In* NASA. Johnson Space Center NASA/American Soceity for Engineering Eduction (ASEE) Summer Faculty Fellowship Program, 1985 104 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 06P

Space motion sickness was not reported during the first Apollo missions; however, since Apollo 8 through the current Shuttle and Skylab missions, approximately 50% of the crewmembers have experienced instances of space motion sickness. Space motion sickness, renamed space adaptation syndrome, occurs primarily during the initial period of a mission until habilation takes place. One of NASA's efforts to resolve the space adaptation syndrome is to model the individual's vestibular response for basis knowledge and as a possible predictor of an individual's susceptibility to the disorder. This report describes a method to analyse the vestibular

system when subjected to a pseudorandom angular velocity input. A sum of sinusoids (pseudorandom) input lends itself to analysis by linear frequency methods. Resultant horizontal ocular movements were digitized, filtered and transformed into the frequency domain. Programs were developed and evaluated to obtain the (1) auto spectra of input stimulus and resultant ocular resonse, (2) cross spectra, (3) the estimated vestibular-ocular system transfer function gain and phase, and (4) coherence function between stimulus and response functions. Author

N86-31428*# Texas Univ., Galveston. Dept. of Internal Medicine.

FLOW CYTOMETRY ANALYSIS OF HORMONE RECEPTORS ON HUMAN PERIPHERAL BLOOD MONONUCLEAR CELLS TO IDENTIFY STRESS-INDUCED NEUROENDOCRINE EFFECTS

R. T. MEEHAN *In* NASA. Johnson Space Center NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 7 p Jul. 1986

Avail: NTIS HC A99/MF E03 CSCL 06P

Understanding the role of circulating peptide hormones in the pathogenesis of space-flight induced disorders would be greatly facilitated by a method which monitors chronic levels of hormones and their effects upon in vivo cell physiology. Single and simultaneous multiparameter flow cytometry analysis was employed to identify subpopulations of mononuclear cells bearing receptors for ACTH, Endorphin, and Somatomedin-C using monoclonal antibodies and monospecific antisera with indirect immunofluorescence. Blood samples were obtained from normal donors and subjects participating in decompression chamber studies (acute stress), medical student academic examination (chronic stress), and a drug study (Dexamethasone). Preliminary results indicate most ACTH and Endorphin receptor positive cells are monocytes and B-cells, exhibit little diurnal variation but the relative percentages of receptor positive cells are influenced by exposure to various stressors and ACTH inhibition. This study demonstrates the capability of flow cytometry analysis to study cell surface hormone receptor regulation which should allow insight into neuroendocrine modulation of the immune and other cellular systems during exposure to stress or microgravity.

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BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research

A86-43535#

DETECTION OF SYSTEM FAILURE BY HUMAN OPERATOR. I - THE CASE OF MONITOR

N. YUHARA and S. HORIUCHI Japan Society for Aeronautical and Space Sciences, Journal (ISSN 0021-4663), vol. 34, April 1986, p. 199-210. In Japanese, with abstract in English. refs

Two models describing human monitoring behavior in failure detection are proposed. The first model consists of two linear optimal estimators (Kalman filters), and the failure detection mechanism is based on Wald's Sequential Probability Ratio Test (SPRT). The two models' performances are validated in the comparison of digital simulation results of failure detection time and accuracy with data obtained from a set of failure detection experiments. R.R.

A86-43539#

REVIEW ON SECONDARY TASK TECHNIQUE FOR WORKLOAD ASSESSMENT SOME CONSIDERATION OF SECONDARY TASK PARADIGMS AND AN ASSESSMENT MODEL

T. YAMAGUCHI (Nihon University, Tokyo, Japan) and Y. NAGASAWA (Japan Air Self Defense Force, Aeromedical Laboratory, Tokyo) Japan Air Self Defence Force, Aeromedical Laboratory, Reports (ISSN 0023-2858), vol. 26, Dec. 1985, p. 159-168. In Japanese, with abstract in English. refs

The secondary task technique is reviewed, technical terms are defined, and a novel measuring paradigm is proposed. This novel paradigm (the dual task paradigm) involves a situation whereby the primary and secondary tasks are performed concurrently; both tasks are considered to be of equal importance and the operator is instructed to perform the two tasks with maximum effort. In effect, emphasis is placed on the maximum channel capacity in which the operator can perform two tasks concurrently. The inherent advantage of this dual task technique lies in the ability to evaluate the operator's workload using a workload index based on the maximum channel capacity and a time based model. K.K.

A86-44601

THEORETICAL PRINCIPLES UNDERLYING THE EVALUATION, CONTROL, AND CORRECTION OF THE IMPACT OF EMOTIONS ON COSMONAUT ACTIVITY [TEORETICHESKIE OSNOVY OTSENKI, METODOV KONTROLIA I KORREKTSII VLIIANIIA EMOTSII NA DEIATEL'NOST' KOSMONAVTA]

P. V. SIMONOV (AN SSSR, Institut Vysshei Nervnoi Deiatel'nosti i Neirofiziologii, Moscow, USSR) Uspekhi Fiziologicheskikh Nauk (ISSN 0301-1798), vol. 17, Apr.-June 1986, p. 20-30. In Russian. refs

The genesis of the emotional stress arising in cosmonauts during space flights is discussed in the framework of Lebedev's (1980) information theory of emotions, which places emphasis on the effects of complete information or the lack of it on the emotional status of the cosmonaut. Among the psychophysiological methods recommended for dynamic evaluation of the pilot's emotional status, the monitoring of involuntary physiological functions, such as the heart rate, eyelid movements, and the acoustic speech parameters, are of primary importance. As the best measure against neuroemotional stress, it is recommended that the pilot be independent of ground-based command and confirmation. The cosmonauts should be given thorough training in a great variety of practical skills needed in regular flight and in every foreseeable emergency situation. I.S.

A86-45955

ENHANCED DETECTION IN THE APERTURE OF FOCAL ATTENTION DURING SIMPLE DISCRIMINATION TASKS

D. SAGI (Weizmann Institute of Science, Rehovot, Israel) and B. JULESZ (AT&T Bell Laboratories, Murray Hill, NJ) Nature (ISSN 0028-0836), vol. 321, June 12, 1986, p. 693-695.

It is considered whether attention directed toward a specific position in the visual field for an orientation discrimination tasks improves performance on a simple detection tasks in the area to which attention is directed. It is found that a small test flash can be detected when it is positioned near a peripheral line target presented briefly, if the orientation of the target has to be identified. The test flash cannot be detected when presented at some distance from the same target or when another target has to be identified. This enhancement implies that even simple identification takes such as orientation discrimination are not performed passively by the visual system. C.D.

N86-30328* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
DIVISION OF ATTENTION AS A FUNCTION OF THE NUMBER OF STEPS, VISUAL SHIFTS, AND MEMORY LOAD
R. A. CHECHILE (Tufts Univ., Medford, Mass.), K. BUTLER, W. GUTOWSKI, and E. A. PALMER 1986 11 p
(Contract NCA2-OR785-801)
(NASA-TM-88775; NAS 1.15:88775) Avail: NTIS HC A02/MF A01

The effects on divided attention of visual shifts and long-term memory retrieval during a monitoring task are considered. A concurrent vigilance task was standardized under all experimental conditions. The results show that subjects can perform nearly perfectly on all of the time-shared tasks if long-term memory retrieval is not required for monitoring. With the requirement of memory retrieval, however, there was a large decrease in accuracy for all of the time-shared activities. It was concluded that the attentional demand of longterm memory retrieval is appreciable (even for a well-learned motor sequence), and thus memory retrieval results in a sizable reduction in the capability of subjects to divide their attention. A selected bibliography on the divided attention literature is provided. Author

N86-30329# Naval Air Development Center, Warminster, Pa. Aircraft and Crew Systems Technology Directorate.
THE EFFECT OF SPECTRALLY SELECTIVE FILTERS ON VISUAL SEARCH PERFORMANCE Final Report
G. T. CHISUM, J. B. SHEEHY, P. E. MORWAY, and G. K. ASKEW 8 Aug. 1985 17 p
(AD-A165835; NADC-85115-60) Avail: NTIS HC A02/MF A01 CSCL 06P

The effect of five spectrally selective filters on the performance of an acuity dependent visual search task was evaluated. The filters were: (A)a neutral density filter (control condition); (B)a 52 00A green interference filter; (C)a 3215-250 red filter; (D)a neodymium visor; and (E)a holographic filter. The observers were presented with five blocks of ten slides per filter. Each slide projected a 6 by 6 deg field of 900 ten min of arc letter Os which contained a single Landolt C. The observers were required to search the field and report the orientation of the opening in the C. The opening in the C, which subtended 2.64 min of arc, required an acuity of 0.39 for detection. Response time, error rate, accommodative accuracy, and the number of fixations and their duration were recorded for each slide presentation. The results demonstrate that filter type had no effect on any of the response measures. During the first three trial blocks the observers appeared to optimize their search strategies, after which they began to revert to their initial performance levels. Although this effect was not supported statistically, this trend indicates that initially search proficiency increases with practice after which it is offset by fatigue. GRA

N86-30330# Pittsburgh Univ., Pa. Psychiatric Inst. and Clinic.
THE IMPORTANCE OF SPECIALIZED COGNITIVE FUNCTION IN THE SELECTION OF MILITARY PILOTS
H. W. GORDON and R. LEIGHTY 19 Mar. 1986 43 p
(Contract N00014-83-K-0208)
(AD-A165889) Avail: NTIS HC A03/MF A01 CSCL 05J

Visuospatial skills significantly distinguished student Naval aviators who dropped out of aviation training from those who received their wings. While both groups were better than average on these tests, the winged aviators were better than the dropout group by 0.25 standard deviation which is highly significant ($P<0.0001$) for the total sample of 600 subjects. Performance on verbal-sequential skills did not distinguish between the groups. Logistic regression not only confirmed the group difference but demonstrated an interaction with verbal-sequential skills. High performance on these skills helped the odds of being winged for aviators with low visuospatial ability but hindered those with high visuospatial ability. Distribution of visusopatial scores for the 2 groups demonstrated reasonable cut-off points at which considerably more drop-outs than winged aviators could have been eliminated. However, these data are relevant only for the selected sample of aviators accepted for the training programs. An additional study on the entire group of applicants including those rejected would allow comparison between the special cognitive tests used in this study and those already used as selection criteria. GRA

N86-30331# SRI International Corp., Menlo Park, Calif.
SPATIOTEMPORAL CHARACTERISTICS OF VISUAL LOCALIZATION Final Report, 1 Jun. 1982 - 31 Aug. 1985
C. A. BURBECK 30 Oct. 1985 21 p
(Contract F49620-82-K-0024)
(AD-A166097; AFOSR-86-0109TR) Avail: NTIS HC A02/MF A01 CSCL 20F

The main thrust of this research effort has been investigation of the spatial and temporal properties of the visual processes underlying relative spatial localization by human observers. The initial tasks were development of a suitable laboratory display system for generating the required stimuli, and development of appropriate experimental paradigms for studying the localization of widely separated objects. The second task was to make careful quantitative measurements of the spatial and temporal properties of the system underlying localization of widely separated objects. It was found that many of the stimulus manipulations that are critical in determination of contrast detection thresholds have little or no effect on localization accuracy. The relative localization of widely separated objects is a highly robust visual ability. Those variations in localization accuracy with changes in the spatial and temporal parameters of the stimulus that were obtained could readily be modeled as natural extensions of the threshold properties. The final task of this project was testing of existing models of spatial ability that can be accounted for by current models of spatial vision. Specific extensions of the existing model were suggested by the data. GRA

N86-30332# Nova Technical, Inc., Tarzana, Calif.
AN INVESTIGATION OF THE USE OF STEADY-STATE EVOKED POTENTIALS FOR HUMAN PERFORMANCE AND WORKLOAD ASSESSMENT AND CONTROL Final Technical Report, 15 Jun. 1983 - 14 Jun. 1985
S. L. MOISE, JR. Jun. 1985 66 p
(Contract F49620-83-C-0102)
(AD-A166205; AFOSR-86-0110TR) Avail: NTIS HC A04/MF A01 CSCL 05J

This program of research investigated Steady-State Evoked Potential (SSEP) measures to determine their utility for evaluating sensory inputs, workload, and performance variables in human operators. A primary purpose was to find techniques and measures that could be generalized to groups of subjects in operational environments. SSEP measures included power (amplitude), coherence, phase lag, and Relative Transmission Time (RTT). Included in this effort were studies of: (1) Frequency masking, where multiple frequencies were presented simultaneously. (2) Sensory inputs which may manipulate SSEP (e.g., color, intensity, cross-modality stimulation). (3) Correlation of SSEP measures with fatigue and tack difficulty. (4) The relationship between performance in a tracking task and SSEP measures. GRA

N86-30333# New York Univ. Medical Center.
NOVEL ARCHITECTURES FOR IMAGE PROCESSING BASED ON COMPUTER SIMULATION AND PSYCHOPHYSICAL STUDIES OF HUMAN VISUAL CORTEX Final Report, 15 Apr. 1983 - 15 Apr. 1985
E. L. SCHWARTZ 2 Jan. 1986 96 p
(Contract F49620-83-C-0108)
(AD-A166222; AFOSR-86-0059TR) Avail: NTIS HC A05/MF A01 CSCL 05J

This final report consists of two parts. The first part is a computer simulation of the functional architecture of the visual cortex, and an examination of the possible significance that this architecture may have for understanding both human visual computation and machine vision. The second part of this report is a psychophysical investigation of human shape perception in terms of boundary descriptors of curvature. GRA

N86-30334# Naval Submarine Medical Research Lab., Groton, Conn.
THE EFFECTS OF COLOR-CODING IN GEOSIT (GEOGRAPHICAL SITUATIONAL) DISPLAYS. 2: REDUNDANT VERSUS NON-REDUNDANT COLOR-CODING Interim Report
A. R. JACOBSEN, W. H. ROGERS, and D. F. NERI 15 Jan. 1986 26 p
(AD-A166263; NSMRL-1069-2) Avail: NTIS HC A03/MF A01 CSCL 05H

The effect on search time of redundant versus non-redundant color-coding of symbols in geographical situational (GEOSIT) displays was evaluated using 36 observers who were randomly assigned to three coding schemes: monochrome-coding, redundant color-coding, and non-redundant color-coding. In the color-coding schemes, only the threat information (Friendly, Unknown, and Hostile) was color coded, either redundantly with shape or not. The platform information (Submerged, Surface, and Airborne) was coded by shape in all three coding schemes. Performance when searching for the color-coded threat target categories was enhanced by over 100% compared to monochrome shape-coding. In addition, response time on the non-color-coded platform categories was significantly faster under the non-redundant color-coding scheme than under the redundant color-coding scheme. Author (GRA)

N86-30335# Institute for Perception Research, Eindhoven (Netherlands).
ACTIVITIES REPORT IN PERCEPTION RESEARCH Annual Report, 1984
1985 161 p
(IPO-19-1984; ESA-86-97398) Avail: NTIS HC A08/MF A01

Research concerning hearing and speech; vision and reading; cognition and communication; information ergonomics; communication aids for the handicapped; and perception studies instrumentation and software is summarized. ESA

N86-30336# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Cognitive Psychology Group.
COGNITIVE ASPECTS OF COMMAND AND CONTROL
G. KEREN and J. G. W. RAAIJMAKERS Jan. 1986 45 p
(IZF-1986-2; TDCK-86-0580; ESA-86-97399) Avail: NTIS HC A03/MF A01

Topics and specific studies within cognitive sciences that have direct relevance to the functioning of a C3 unit are reviewed. Issues related to the manner in which information is obtained and processed, and the different aspects that are related to the decision process are discussed. Research subjects on command and control systems are suggested. ESA

N86-30337# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Human Performance Group.
ATTENTION TASKS AND THEIR RELATION TO AGING AND FLIGHT EXPERIENCE
L. C. BOER Feb. 1986 28 p
(Contract A83/KLU/078)
(IZF-1986-4; TDCK-86-0585; ESA-86-97400) Avail: NTIS HC A03/MF A01

The Dichotic Listening Task (DLT) of Gopher and Kahneman (1971) was studied in a group of 143 aviators, aged between 17 and 70 yr. Other tasks of the study were the Continuous Memory Task (CMT) and two choice-RT tasks with visual stimuli. An attention questionnaire was also administered. Aging has negative effects on all tasks, especially on the DLT. With age factored out, no substantial correlations between DLT and other tasks are found. The only exception is a moderate correlation with choice RT. Differences between subgroups of aviators (42 airline pilots and 50 private pilots) were studied. The assumption was that airline pilots had higher levels of aviator skill. The DLT, CMT, and one of the RT tasks correlate with aviator subgroup. A second study with 16 flight cadets finds significant correlations between DLT and RT tasks on the one hand, and pilot gradings obtained later. It is concluded that DLT and RT tasks offer prospects for improving the selection of aviators. ESA

N86-31216# California Univ., Los Angeles. Medical Center.
NEUROPHYSIOLOGICAL RESEARCH SUPPORTING THE INVESTIGATION OF ADAPTIVE NETWORK ARCHITECTURES Final Report, 1 Mar. 1983 - 28 Feb. 1985
C. D. WOODY 14 Aug. 1985 90 p
(Contract F49620-83-C-0077)
(AD-A166074; AFOSR-86-0083TR) Avail: NTIS HC A05/MF A01 CSCL 06P

The investigators have shown that single cortical neurons adapt in such a way as to support learned behavior. What is particularly interesting is the indication that purposefully complex, molecular cascades exist at the level of single nerve cells to permit successful adaptions to occur. Successful adaptions are defined as: (a) producing the desired alteration of response to the appropriate input, (b) enduring over time, (c) not interfering with other adaptions occurring for another purpose in the same cell, and (d) not interfering with the main-throughput-message transfer property of the nerve cell. The result of these adaptations is to support the operation of a self-organizing information processing system with a high success: error ratio and excellent survivability in the face of substantial environmental change. Changes in the excitability of cortical neurons occur that lead to acquisition of the ability to perform specific motor tasks in response to specific auditory stimuli. Rates of acquiring this ability can be substantially increased by adding electrical stimulation of the hypothalamus associatively, to presentations of conventional conditioned and unconditioned stimuli. Part of this acceleration of learning the motor response may derive from recruitment of a new performance pathway-reflected in a longer transmission latency for movement production. A long range goal of the research is to understand how the system picks the right pathway. GRA

N86-31217# Northwestern Univ., Evanston, Ill. Vision Lab.
SENSITIVITY TO VISUAL MOTION IN STATISTICALLY DEFINED DISPLAYS Final Report, Nov. 1981 - Nov. 1982
R. W. SEKULER, D. W. WILLIAMS, and S. A. HARP Mar. 1986 148 p
(Contract MDA903-80-C-0154; DA PROJ. 2Q1-61102-B-74-F)
(AD-A167291; ARI-RN-86-30) Avail: NTIS HC A07/MF A01 CSCL 05J

This project explored aspects of how human observers perceive moving targets, particularly targets whose motion is apparent rather than continuous. Major topics covered include origins of global motion Percepts, and size factors in apparent motion. GRA

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MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

A86-44094
AIR AMBULANCE REGULATIONS - A MODEL
F. THOMAS, H. GIBBONS, and T. P. CLEMMER (LDS Hospital; Salt Lake County, Dept. of Health; Utah, University, Salt Lake City) Aviation, Space, and Environmental Medicine (ISSN 0095-6562), vol. 57, July 1986, p. 699-705. refs

Prior attempts at establishing minimal federal air ambulance regulations and standards have been unsuccessful. However, reports of poor patient medical care during transport by some air ambulance services is now forcing many states to initiate air ambulance regulations. In 1984, the State of Utah Emergency Medical Services convened a special subcommittee to develop aeromedical regulations for the State of Utah. Using a three-level approach based upon the patient's requirements for basic, advanced, or specialized medical care and the urgency of transport, the subcommittee was able to derive medical categories necessary for the selection and utilization of air ambulance services. Minimum

air ambulance regulations were then established for aircraft configuration, flight crew requirements, minimal equipment and medications, and the responsibilities of the medical director or designee for each of the three levels of medical care. It is concluded that the application of a levels approach based upon the patient's medical requirements may be useful in assisting other states attempting to establish flexible but specific regulations directed at the safe transport of patients by aeromedical evacuation. Author

A86-44532
INTELLIGENT CREW WORKSTATIONS
D. STANLEY, R. WORDEN, and R. RIVERS (Logica UK, Ltd., Cambridge, England) IN: Space - Technology and opportunity; Proceedings of the Conference, Geneva, Switzerland, May 28-30, 1985 . Pinner, England, Online Publications, 1985, p. 69-80.

A preliminary framework for analysis of crew workstation user interface issues is presented. The Framework attempts to map factors relating to individual users, the space station environment, tasks and the particular 'states' of the Space Station onto desirable user interface characteristics. Factors relating to the individual are discussed with respect to the provision of an adaptable user interface through the use of 'user models' derived from an intelligent training environment. Author

A86-44534
ENVIRONMENTAL CONTROL AND LIFE SUPPORT SYSTEMS
K. THORMER (Dornier System GmbH, Friedrichshafen, West Germany) IN: Space - Technology and opportunity; Proceedings of the Conference, Geneva, Switzerland, May 28-30, 1985 . Pinner, England, Online Publications, 1985, p. 91-100. refs

The design of the life support and environmental control systems (ECLSS) for the ESA Columbus module of the Manned Space Station (MSS) is proceeding mainly on the basis of experience with Spacelab. One deviation will be recycle waste water and breathing air wherever possible to avoid transportation costs, closing the on-board loop where possible. CO2 will, however, initially have to be removed from the air, probably with LiOH cartridges that will be returned to earth when the cartridges reach capacity. A solid amine CO2 regenerator is being studied to eliminate the cartridges. Subsequent evolutions will move toward closing the loop with electrolytic oxygen generation, probably with water vapor electrolysis. Reliable removal of air constaminants will require basic research in the technology. A block diagram is provided of the proposed ECLSS design. M.S.K.

A86-44779
THE TECHNOLOGY IMPACT OF THE ADVANCED TECHNOLOGY CREW PROTECTION (ATCP) SYSTEM ON HIGH PERFORMANCE AIRCRAFT
K. K. ALEXANDER (USAF, Flight Dynamics Laboratory, Wright-Patterson AFB, OH), T. A. HENNEMAN, and S. A. THOMPSON (Northrop Corp., Aircraft Div., Hawthorne, CA) SAFE Journal, vol. 16, no. 2, Summer 1986, p. 22-27.
(Contract F33615-84-C-3407)

A description of the Advanced Technology Crew Protection (ATCP) system, integrating many cockpit functions and components directly into the crewman's flight garment, and including a 57-degree semisupine seat and aircraft mounted ancillary equipment, and its potential impact on future fighter aircraft performance, are presented. The system is capable of protecting against high g forces, high q forces, high altitudes, Nuclear Biological Chemical threats, and High Energy fragments, and it provides all-axis restraint, closed-loop cooling, and breathing assistance. Emergency subsystems will enable critical autonomous operational capability, and the ATCP will provide get-me-down capability or post-ejection survival protection. Crewmember stress and fatigue is expected to be lowered, and, for the aircraft studied, it is expected that the ATCP will provide increase altitude capability, lower drag, and very high-g capability. R.R.

A86-45014
PREFERRED DECLINATION OF THE LINE OF SIGHT
S. G. HILL and K. H. E. KROEMER (Virginia Polytechnic Institute and State University, Blacksburg) Human Factors (ISSN 0018-7208), vol. 28, April 1986, p. 127-134. refs

This research concerned the angle at which people prefer to look down at visual targets and tasks. Thirty-two subjects participated in a study with four different head positions, two visual tasks, and two target distances. The overall preferred mean angle in the midsagittal plane below the Frankfurt Plane was -34 deg. Head position had significant effects on angle: subjects sitting with their heads upright preferred an average declination of -29 deg, but -40 deg when supine. Target distance also significantly affected the line-of-sight angle, with subjects preferring targets at 0.50 m to be at -38 deg, but targets at twice that distance at -30 deg. The task did not influence the preferred angle. Author

A86-45015
VISUAL ACCOMMODATION AND VIRTUAL IMAGE DISPLAYS - TARGET DETECTION AND RECOGNITION
J. NORMAN and S. EHRLICH (Haifa, University, Israel) Human Factors (ISSN 0018-7208), vol. 28, April 1986, p. 135-151. refs

Twelve subjects performed a complex task, detecting and recognizing small targets presented at infinity, while simultaneously monitoring a virtual image display (VID). The VID was presented at one of four optical distances (2.0, 0.5, 0.0, and -0.5 D). Optical distance was found to affect detection and recognition performance, mainly at the extreme value of 2.0 D. Interactions between optical distance and grouping of subjects according to measures of accommodation indicated that the three other optical distances affect performance differentially. The subjects' resting position of accommodation (RPA) and a combined measure of accommodation range and RPA were significantly correlated with performance (0.58). A narrowing of the functional visual field (complete misses of peripheral targets) was found at the 2.0-D optical distance for all subjects, and at the other optical distances for the subjects with an inferior accommodative mechanism (i.e., a near RPA and/or a narrow accommodation range). Author

A86-45073
METHODS OF MEASURING THE ATTENUATION OF HEARING PROTECTION DEVICES
E. H. BERGER (Cabot Corp., Indianapolis, IN) Acoustical Society of America, Journal (ISSN 0001-4966), vol. 79, June 1986, p. 1655-1687. refs

Hearing protection device (HPD) attenuation evaluation methods are described. The insertion loss of an HPD is utilized to assess the reduction in sound pressure level (SPL) when HPDs are applied. The experimental conditions and procedures for three real-ear attenuation at threshold (REAT) techniques, nine above-threshold methods, and four objective methods of measuring hearing protection attenuation are examined. The accuracy, practicality, and applicability of the various techniques are analyzed. Measurements on linear and nonlinear HPDs and the potential level dependent effects are investigated. It is observed that the REAT method is the most accurate because it assesses all sound paths to the occulded ear. The data indicate that attenuation is independent of SPL for linear protectors and therefore the use of above-threshold procedures to evaluate attenuation is not required. It is detected that all objective procedures do not accurately evaluate the significance of the flanking-bone conduction paths; however, the acoustical test fixture technique is recommended based on quality control, time savings, and buyer acceptance testing. A microphone in real-ear approach is proposed for future attenuation evaluations. I.F.

A86-45117
EXPERIMENTAL ESTIMATE OF THE PARAMETERS OF A STOCHASTIC MODEL OF A HUMAN OPERATOR SENSOR SYSTEM
I. V. KUROCHKIN and A. A. MALTSEV Automation and Remote Control (ISSN 0005-1179), vol. 46, no. 12, May 10, 1986, pt. 1, p. 1547-1554. Translation. refs

A technique of estimation is proposed for the parameters of a stochastic adaptive model of the sensor system of a human operator (i.e., the perceived noise level, the time constant, and the signal-to-noise ratio). The experimental results are presented for various sensitivities of the indicator and the strength of the disturbances acting on the plant. The increase in the perceived noise in two-variable tracking is estimated in comparison to one-variable tracking. Author

A86-45692* Life Systems, Inc., Cleveland, Ohio.
ENVIRONMENTAL CONTROL/LIFE SUPPORT SYSTEM FOR SPACE STATION
C. W. MILLER, D. B. HEPPNER, F. H. SCHUBERT, and M. J. DAHLHAUSEN (Life Systems, Inc., Cleveland, OH) Earth-Oriented Applications of Space Technology (ISSN 0277-4488), vol. 6, no. 2, 1986, p. 213-229. Research supported by Life Systems, Inc., and NASA.

The functional, operational, and design load requirements for the Environmental Control/Life Support System (ECLSS) are described. The ECLSS is divided into two groups: (1) an atmosphere management group and (2) a water and waste management group. The interaction between the ECLSS and the Space Station Habitability System is examined. The cruciform baseline station design, the delta and big T module configuration, and the reference Space Station configuration are evaluated in terms of ECLSS requirements. The distribution of ECLSS equipment in a reference Space Station configuration is studied as a function of initial operating conditions and growth orbit capabilities. The benefits of water electrolysis as a Space Station utility are considered. I.F.

A86-46941#
ADVANCED SPACE SUIT DEVELOPMENT FOR FUTURE ON-ORBIT OPERATIONS
J. L. ZELON (ILC Space Systems, Houston, TX) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 8 p. refs
(AIAA PAPER 86-2310)

This paper describes the planned space suit developments for future on-orbit operations including Shuttle, Space Station and Transatmospheric based missions. The issues driving design changes in the current Shuttle EMU for Space Station are defined. In addition, advanced development programs underway by NASA in pressure suit closure design, joint technology and glove technology are identified. Author

A86-46942#
ZERO-G SIMULATION VERIFIES EVA SERVICING OF SPACE STATION MODULES
B. N. GRIFFIN (Boeing Aerospace Co., Huntsville, AL) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 6 p.
(AIAA PAPER 86-2312)

The Space Station accommodations required for on orbit zero-g maintenance and repair were evaluated during two months of neutral buoyancy testing. Boeing, in a joint effort with NASA, used Shuttle-type pressure suits and the simulated weightlessness provided by neutral buoyancy to assess four areas of hardware and operations. These included: (1) Space Station System Architecture; (2) Common Module Exterior; (3) Common Module Interior; and (4) Voice-Activated Systems. Specifically, the tests focused on servicing debris shield/body-mounted radiator panels, replacement of thermal blankets or Multi-Layer insulation and repair techniques for debris damage. Design engineers and astronauts participated as pressure-suited test subjects in evaluation of a broad range of concept options. The significant findings for these tests are: (1) the astronaut positioning arm is one of the most useful tools for Space Station EVA operations; (2) the minimum separation between modules should be 78 inches; (3) axial debris panels were preferred over circumferential; (4) on-orbit repair techniques for debris-damaged modules were effective; and (5) voice-activated systems are ideal for EVA. Improved suit communications, however, are required for implementation. Author

A86-46943*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
GROWTH EVOLUTION OF THE SPACE STATION ECLSS
W. R. HUMPHRIES (NASA, Marshall Space Flight Center, Huntsville, AL) and R. G. SOSNAY (Martin Marietta Aerospace, Denver, CO) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 10 p.
(AIAA PAPER 86-2313)

This paper discusses the planned evolution and growth of the Space Station ECLSS. It discusses the planning on-going at the early design stages to enable growth from a man-tended configuration of the Space Station (wherein the Space Station would be manned only when visited by the Orbiter) to a fully operational configuration (called Initial Operational Capability - IOC) which includes a permanently manned, fully operational Space Station. The paper then also discusses how the IOC Space Station ECLSS can evolve to account for increase in crew sizes, increase in the number of attached modules, increase in the capability to handle more payload/customer support, and potential evolution of the ECLSS technologies. Author

A86-46944#
IMPACT OF AUTOMATION ON SPACE STATION MMI DESIGN
P. G. JAMAR (Honeywell Systems and Research Center, Minneapolis, MN) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 5 p. refs
(AIAA PAPER 86-2316)

Space-based crews are expected to interact with highly automated and possibly intelligent systems, to perform these interactions with often little or no prior training, and to do so on an infrequent or sporadic basis. These activities will characterize a new role for space-based crews, that of supervisory control. Supervisory control tasks in turn define a new set of requirements for Space Station man-machine interface (MMI) design: (1) multi-function display and control hardware, (2) displays that enhance the crew person's 'mental model' of invisible processes, (3) highly supportive man-machine dialogue, including special features to support dialogue with expert systems, and (4) incorporation of machine intelligence into the MMI itself to provide a seemingly uniform interface to numerous processes, data bases, and expert systems. A discussion of these concepts is illustrated by examples from recent MMI designs, including a multi-function display and control system developed for the Space Shuttle, and MMI system developed for NASA JSC for the Space Station environmental control and life support system, and ATOZ - an intelligent interface system. Author

A86-46945*# Boeing Aerospace Co., Huntsville, Ala.
ADVANCED OPERATOR/SYSTEM INTERFACE CONCEPTS FOR THE SPACE STATION
C. M. CASE and P. S. Y. LIN (Boeing Aerospace Co., Huntsville, AL) AIAA, Space Station in the Twenty-first Century, Meeting, Reno, NV, Sept. 3-5, 1986. 8 p.
(Contract NAS8-36526)
(AIAA PAPER 86-2317)

Concepts and data developed as part of the Preliminary Space Station Automation and Robotics Plan are reviewed as well as candidate selection criteria, technology assessments, and preliminary candidate recommendations. A need for development of advanced operator/systems interface (OSI) concepts to support future Space Station automation and robotics applications is identified. Four candidate applications, illustrating the potential benefits of an advanced OSI, are described. These include: (1) a conversational OSI system, (2) a laboratory experiment manipulator system, (3) a module safety advisor, and (4) an integrated

maintenance/training system. These specific automation and robotics applications are expected to occur relatively early in the growth of the Space Station and to provide significant commercial and station benefits throughout the life of the station. Author

N86-30338*# California Univ., Davis. Dept. of Psychology.
IMPLICATIONS OF PRIVACY NEEDS AND INTERPERSONAL DISTANCING MECHANISMS FOR SPACE STATION DESIGN Progress Report, Jul. - Aug. 1985
A. A. HARRISON, R. SOMMER, N. STRUTHERS, and K. HOYT 30 Aug. 1985 26 p
(Contract NAG2-357)
(NASA-CR-176938; NAS 1.26:176938) Avail: NTIS HC A03/MF A01 CSCL 05H

Privacy needs, or the need of people to regulate their degree of contact with one another, and interpersonal distancing mechanisms, which serve to satisfy these needs, are common in all cultures. Isolation, confinement, and other conditions accociated with space flight may at once accentuate privacy needs and limit the availability of certain common interpersonal contact. Loneliness occurs when people have less contact with one another than they desire. Crowding occurs when people have more contact with one another than they desire. Crowding, which is considered the greater threat to members of isolated and confined groups, can contribute to stress, a low quality of life, and poor performance. Drawing on the general literature on privacy, personal space, and interpersonal distancing, and on specialized literature on life aboard spacecraft and in spacecraft-analogous environments, a quantitative model for understanding privacy, interpersonal distancing, loneliness, and crowding was developed and the practical implications of this model for space station design were traced. Author

N86-30339*# SRI International Corp., Menlo Park, Calif.
SPECIFICATIONS PHYSIOLOGICAL MONITORING SYSTEM
15 Jul. 1985 73 p
(Contract NAS9-16811)
(NASA-CR-171926; NAS 1.26:171926) Avail: NTIS HC A04/MF A01 CSCL 06B

The operation of a physiological monitoring system (PMS) is described. Specifications were established for performance, design, interface, and test requirements. The PMS is a compact, microprocessor-based system, which can be worn in a pack on the body or may be mounted on a Spacelab rack or other appropriate structure. It consists of two modules, the Data Control Unit (DCU) and the Remote Control/Display Unit (RCDU). Its purpose is to collect and distribute data from physiological experiments in the Spacelab and in the Orbiter. Author

N86-30340# Clarke Ambrose, Inc., Knoxville, Tenn.
HUMAN FACTORS ACTIVITIES IN TELEOPERATOR DEVELOPMENT AT THE OAK RIDGE NATIONAL LABORATORY
J. V. DRAPER and J. N. HERNDON 1986 15 p Presented at the International Topical Meeting on Advances in Human Factors in Nuclear Power Systems, Knoxville, Tenn., 21 Apr. 1986 Prepared in cooperation with ORNL, Tenn.
(Contract DE-AC05-84OR-21400)
(DE86-005160; CONF-860415-2) Avail: NTIS HC A02/MF A01

The Consolidated Fuel Reprocessing Program (CFRP) at the Oak Ridge National Laboratory is developing advanced teleoperator systems for maintenance of future nuclear reprocessing facilities. Remote maintenance systems developed by the CFRP emphasize man-in-the-loop teleoperation. Consequently, human factors issues which affect teleoperator performance must be addressed. This paper surveys research and development activities carried out by the human factors group within the Remote Control Engineering Task of the CFRP. DOE

N86-30341# Foersvarets Forskingsansalt, Stockholm (Sweden).
ASSISTED POSITIVE PRESSURE BREATHING AND MODIFIED ANTI-ACCELERATION SUIT FILLING TESTED UP TO 9 G IN A HUMAN CENTRIFUGE, KAROLINSKA INSTITUTE
U. I. BALLDIN Feb. 1986 14 p In SWEDISH; ENGLISH summary Sponsored by Swedish Material Administration of Armed Forces Air Material Department
(FOA-C-50038-H1; ISSN-0347-7665; ESA-86-97242) Avail: NTIS HC A02/MF A01

A modified anti-acceleration suit with ready pressure, faster filling, and higher end-pressure combined with normal breathing, and assisted and unassisted positive pressure breathing, was tested. Two acceleration-induced losses of consciousness occur at 8 to 9 G with normal breathing, but not with positive pressure breathing. Further negative physiological reactions are not recorded. Assisted positive pressure breathing is usually rated as best. Additional physical inconvenience occurs as a consequence of the high acceleration stresses, irrespective of equipment. ESA

N86-31218*# Georgia Inst. of Tech., Atlanta. Center for Man-Machine Systems Research.
PILOT INTERACTION WITH AUTOMATED AIRBORNE DECISION MAKING SYSTEMS Semiannual Progress Reports, Aug. - Jul. 1985
W. B. ROUSE, J. M. HAMMER, C. M. MITCHELL, N. M. MORRIS, C. M. LEWIS, and W. C. YOON Jul. 1985 50 p
(Contract NAG2-123)
(NASA-CR-176986; NAS 1.26:176986) Avail: NTIS HC A03/MF A01 CSCL 05H

Progress was made in the three following areas. In the rule-based modeling area, two papers related to identification and significane testing of rule-based models were presented. In the area of operator aiding, research focused on aiding operators in novel failure situations; a discrete control modeling approach to aiding PLANT operators was developed; and a set of guidelines were developed for implementing automation. In the area of flight simulator hardware and software, the hardware will be completed within two months and initial simulation software will then be integrated and tested.

N86-31219*# Georgia Inst. of Tech., Atlanta.
REPRESENTATION FOR CLOSED FORM SIGNIFICANCE TESTING IN VL1
C. M. LEWIS *In its* Pilot Interaction With Automated Airborne Decision Making Systems 11 p Jul. 1985
Avail: NTIS HC A03/MF A01 CSCL 05H

Within the constraints of the syntax language, the set of observation descriptions which determines the discriminations which can be made, and the number of observations classified, a method is to be devised for determining the relative frequency over instantiation with which a rule of equal or greater generality would be identified. Generality, here, is defined as the number of observations described by a rule. A covering algorithm (Aq, Michalski 1973) was used to identify pilot strategy (system of rules) in maneuvering to avoid intruders. B.G.

N86-31220*# Georgia Inst. of Tech., Atlanta.
A DISCRETE CONTROL MODEL OF PLANT
C. M. MITCHELL *In its* Pilot Interaction With Automated Airborne Decision Making Systems 31 p Jul. 1985
Avail: NTIS HC A03/MF A01 CSCL 05H

A model of the PLANT system using the discrete control modeling techniques developed by Miller is described. Discrete control models attempt to represent in a mathematical form how a human operator might decompose a complex system into simpler parts and how the control actions and system configuration are coordinated so that acceptable overall system performance is achieved. Basic questions include knowledge representation, information flow, and decision making in complex systems. The structure of the model is a general hierarchical/heterarchical scheme which structurally accounts for coordination and dynamic focus of attention. Mathematically, the discrete control model is

defined in terms of a network of finite state systems. Specifically, the discrete control model accounts for how specific control actions are selected from information about the controlled system, the environment, and the context of the situation. The objective is to provide a plausible and empirically testable accounting and, if possible, explanation of control behavior. B.G.

N86-31221# Midwest Research Inst., Kansas City, Mo.
DEVELOPMENT OF THERMOELECTRIC WATER HEATING-COOLING DEVICES Final Rept. Feb. - Oct. 1985
B. MATHIPRAKSAM 25 Oct. 1985 28 p
(Contract DAAK60-85-C-0011; DA PROJ. 1L1-62724-AH-99)
(AD-A166949; NATICK-TR-86/019) Avail: NTIS HC A03/MF A01 CSCL 13A

A simple, safe, and reliable thermoelectric device for heating or cooling potable water for use in military vehicles was developed. The unit is capable of cooling water to 60 F in ambient temperatures up to 130 F and heating to 150 F in ambient temperatures of 40 F. Freezing/overheating and undervoltage protections are provided. The unit has also cooling/heating indicators, water ready indicators, and automatic switch off. A total of six units were built, tested, and delivered to U.S. Army Natick R&D Center. Author (GRA)

N86-31222# Sandia National Labs., Albuquerque, N. Mex.
MAKING THE HUMAN-MACHINE INTERFACE RESPONSIVE TO MANY CLASSES OF USERS
R. W. BARNARD 1986 15 p Presented at the DECUS Symposium, Dallas, Tex., 27 Apr. 1986
(Contract DE-AC04-76DP-00789)
(DE86-003453; CONF-860470-1) Avail: NTIS HC A02/MF A01

An applications program must be able to interact with users who have a range of familiarity with its operation. A novice user needs more guidance than an experienced one, and a rigid type of interaction (such as menus) will not meet the needs of all users. Frustrations with the program are reduced and productivity is increased by using a flexible means of response which matches the level of response to the needs of the user. This paper illustrates techniques to provide only as much guidance as the user requires. The methods discussed here permit the user to switch among three levels of guidance (none, short prompts, and menus) and to have context-sensitive help readily available Because frequent users of a program will soon become quite proficient, supplying default answers and command entry shortcuts are also beneficial. These techniques have been used in a program which meets the needs of users who have all ranges of proficiency. DOE

N86-31223# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. System Safety Development Center.
BASIC HUMAN FACTORS CONSIDERATIONS
R. J. NERTNEY and D. L. FILLMORE Dec. 1985 37 p
(Contract DE-AC07-76ID-01570)
(DE86-008181; SSDC-34) Avail: NTIS HC A03/MF A01

Models and concepts for analyzing the human element in working programs and systems are introduced. The method of attack is a functional one based on analysis of the work to be done (job-task analysis). Based on the results of the job-task analysis, psychological and physiological requirements and criteria can be defined for the system. DOE

N86-31224# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. System Safety Development Center.
IMPACT OF THE HUMAN ON SYSTEM SAFETY ANALYSIS
R. J. NERTNEY and R. L. HORMAN Sep. 1985 34 p
(Contract DE-AC07-76ID-01570)
(DE86-008182; SSDC-32) Avail: NTIS HC A03/MF A01

The impact of the human and human reliability on the results of probabilistic risk assessment studies is discussed in terms of some of the standard models used in risk quantification. Three levels of analysis are considered: (1) identification of areas where the human affects the operational risks; (2) rough scaling and quantification of the effect of the human on operational outcome; and (3) complete quantification of the risks including consideration of human reliability. DOE

N86-31225# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho.
PROCESS OF TASK ANALYSIS
H. S. BLACKMAN, D. I. GERTMAN, and L. N. HANEY Sep. 1985 32 p
(Contract DE-AC07-76ID-01570)
(DE86-008183; EGG-SSDC-31) Avail: NTIS HC A03/MF A01

The paper presents a task analysis form for the organization of task analysis efforts. In terms of the form, task descriptions for use in task analysis data collection are given, and detailed definitions of 35 task analysis categories are offered. The categories include important aspects of task performance, consequences, and feedback, as well as aspects of training and knowledge requirements. Methods behind the derivations of tasks and subtasks, and category analysis are explained. Aspects of data applications concerning who and how are discussed. Task analysis can be used in the development of behavioral learning objectives and instructional strategies. Action verbs are often used in category analysis and human capabilities identification. Curriculum and tesis may be developed by analyzing what people do and need in their jobs. The process of task analysis is a useful tool in the analysis and improvement of human job performance. DOE

N86-31226# Edgerton, Germeshausen and Grier, Inc., Idaho Falls, Idaho. System Safety Development Center.
HUMAN FACTORS MANAGEMENT
R. J. NERTNEY and D. L. FILLMORE Jul. 1985 44 p
(Contract DE-AC07-76ID-01570)
(DE86-008184; SSDC-30) Avail: NTIS HC A03/MF A01

Evaluating a system to determine if it has the right people working using the right procedures and management controls with the right hardware at all times is the facet of human factors discussed in this manual. The following areas of concern are specifically addressed: (1) the selection process must be proper to select qualified workers who are given proper training for the work and whose skills are maintained; (2) a proper behavioral climate must be established at the work station; (3) all task assignments must contain elements of instruction and training; and (4) all supporting systems must interact with the human to ensure that the work can be completed. All of these areas of concern can be successfully completed using the existing company organization by following the considerations presented in this document and maintaining proper interfaces between the different branches of the company. DOE

N86-31412*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
EVALUATING SPACE STATION APPLICATIONS OF AUTOMATION AND ROBOTICS TECHNOLOGIES FROM A HUMAN PRODUCTIVITY POINT OF VIEW
J. F. BARD *In its* NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 46 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 05H

The role that automation, robotics, and artificial intelligence will play in Space Station operations is now beginning to take shape. Although there is only limited data on the precise nature of the payoffs that these technologies are likely to afford there is a general consensus that, at a minimum, the following benefits will be realized: increased responsiveness to innovation, lower operating costs, and reduction of exposure to hazards. Nevertheless, the question arises as to how much automation can be justified with the technical and economic constraints of the program? The purpose of this paper is to present a methodology which can be used to evaluate and rank different approaches to automating the functions and tasks planned for the Space Station. Special attention is given to the impact of advanced automation on human productivity. The methodology employed is based on the Analytic Hierarchy Process. This permits the introduction of individual judgements to resolve the confict that normally arises when incomparable criteria underly the selection process. Because of the large number of factors involved in the model, the overall

problem is decomposed into four subproblems individually focusing on human productivity, economics, design, and operations, respectively. The results from each are then combined to yield the final rankings. To demonstrate the methodology, an example is developed based on the selection of an on-orbit assembly system. Five alternatives for performing this task are identified, ranging from an astronaut working in space, to a dexterous manipulator with sensory feedback. Computational results are presented along with their implications. A final parametric analysis shows that the outcome is locally insensitive to all but complete reversals in preference. Author

N86-31422*# Utah Univ., Salt Lake City. Center for Occupational and Environmental Health.
DEFINING RECLAIMED WATER POTABILITY REQUIREMENTS
D. S. JANIK *In* NASA. Johnson Space Center NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 49 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 06K

Water used during previous space missions has been either carried or made aloft. Future human space endeavors will probably have to utilize some form of water reclamation and recycling. There is little applied experience in either the US or foreign space programs with this technology. Water reclamation and recycling constitutes an engineering challenge of the broadest nature and will require an intensive research and development effort if this technology is to mature in time for practical use on the proposed US spacestation. In order for this to happen, reclaimed/recycled water specification will need to be devised to guide engineering development. Perhaps the most strigent specifications will involve water to be consumed. NASA's present Potable Water Specifications are not applicable to reclaimed or recycled potable water. No specifications for reclaimed or recycled potable water presently exist either inside or outside NASA. NASA's past experience with potable water systems is reviewed, limitations of the present Potable Water Specifications are examined, present world expertise with potable water reclamation/recycling systems and system analogs is reviewed, and an approach to developing pertinent Reclaimed/Recycled Potable Water Specifications for spacecraft is presented. Author

A86-44354* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
DIATOMS ON EARTH, COMETS, EUROPA AND IN INTERSTELLAR SPACE
R. B. HOOVER, M. J. HOOVER (NASA, Marshall Space Flight Center, Huntsville, AL), F. HOYLE, N. C. WICKRAMASINGHE, and S. AL-MUFTI (University College, Cardiff, Wales) Earth, Moon, and Planets (ISSN 0167-9295), vol. 35, May 1986, p. 19-45. refs

There exists a close correspondence between the measured infrared properties of diatoms and the infrared spectrum of interstellar dust as observed in the Trapezium nebula and toward the galactic center source GC-IRS 7. Diatoms and bacteria also exhibit an absorbance peak near 2200 A, which is found to agree with the observed ultraviolet absorbance properties of interstellar grains. The observational data are reviewed, and the known properties of diatoms and bacteria are considered. It is suggested that these characteristics are consistent with the concept of a cosmic microbiological system in which these or similar microorganisms might exist on comets, Europa and in interstellar space. Author

A86-44358
THE VIABILITY WITH RESPECT TO TEMPERATURE, OF MICRO-ORGANISMS INCIDENT ON THE EARTH'S ATMOSPHERE
F. HOYLE, N. C. WICKRAMASINGHE, and S. AL-MUFTI (University College, Cardiff, Wales) Earth, Moon, and Planets (ISSN 0167-9295), vol. 35, May 1986, p. 79-84.

Laboratory tests on E. coli types ATCC/0537 and ATCC/35218 established the survival of bacteria on flash heating in a vacuum to at least 800 K. The experimental results, and the model developed for a microorganism impacting the terrestrial atmosphere, determined that essentially all microorganisms in prograde orbits could be added to the earth without losing viability due to heating as they were slowed by the atmospheric gases. R.R.

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PLANETARY BIOLOGY

Includes exobiology; and extraterrestrial life.

A86-43927#
THE QUESTION OF LIFE ON MARS
B. ADELMAN British Interplanetary Society, Journal (Solar System Exploration) (ISSN 0007-084X), vol. 39, June 1986, p. 256-262. refs

The discoveries made with respect to Martian life are described with particular emphasis placed on the Viking Lander biology experiments. Post-Viking research is discussed along with plans for further investigation on future missions. The views of Levin and Straat (1981) are outlined with attention given to the following: (1) oxidizing compounds, (2) the adverse effects of water, (3) the heating of controls, (4) the absence of organic compounds, and (5) the notion that the results of the Gas Exchange Experiment and the Labeled Release Experiment are nonbiological. The presumed properties of Martian life (if it does exist) include the following: (1) Martian life is carbon based, (2) Martian organisms are microscopic in size, (3) they are anaerobes functioning at a low metabolic level, and (4) they are highly resistant to extreme cold and dryness. Criteria established by the National Research Council for Martian life are outlined. K.K.

N86-30342*# Columbia Univ., New York.
EFFECTS OF SIMULATED WEIGHTLESSNESS ON MEIOSIS, FERTILIZATION, AND EARLY DEVELOPMENT IN MICE Final Report, 1 Jul. 1982 - 30 Apr. 1986
D. J. WOLGEMUTH 1986 18 p
(Contract NAG2-324)
(NASA-CR-177106; NAS 1.26:177106) Avail: NTIS HC A02/MF A01 CSCL 06C

The initial goal was to construct a clinostat which could support mammalian cell culture. The clinostat was selected as a means by which to simulate microgravity conditions within the laboratory, by constant re-orientation of cells with respect to the gravity vector. The effects of this simulated microgravity on in-vitro meiotic maturation of oocytes, using mouse as the model system, was investigated. The effects of clinostat rotation on fertilization in-vitro was then examined. Specific endpoints included examining the timely appearance of male and female pronuclei (indicating fertilization) and the efficiency of extrusion of the second polar body. Particular attention was paid to detecting anomalies of fertilization, including parthenogenetic activation and multiple pronuclei. Finally, for the preliminary studies on mouse embryogenesis, a key feature of the clinostat was modified, that of the position of the cells during rotation. A means was found to immobilize the cells during the clinostat reotation, permitting the cells to remain at the axis of rotation yet not interfering with cellular development. B.G.

N86-30343*# Maryland Univ., Baltimore. Dept. of Neurology.
A POSSIBLE ROLE FOR ENDOGENOUS GLUCOCORTICOIDS IN ORCHIECTOMY-INDUCED ATROPHY OF THE RAT LEVATOR ANI MUSCLE: STUDIES WITH RU38486, A POTENT AND SELECTIVE ANTIGLUCOCORTICOID
M. KONAGAYA (Nara Medical Coll., Japan) and S. R. MAX Nov. 1985 17 p Submitted for publication
(Contract NAG2-100)
(NASA-CR-177029; NAS 1.26:177029) Avail: NTIS HC A02/MF A01 CSCL 06C

RU38486, a potent and selective antiglucocorticoid, was employed to study a possible role for endogenous glucocorticoids in atrophy of the levator ani muscle secondary to castration of male rats. RU38486 was shown to block (3H) triamcinolone acetonide binding to cytosol from levator ani muscle. Daily oral administration of RU38486 to castrated rats partially prevented atrophy of the levator ani muscle, as well as a decrease in RNA concentration. In a control group receiving RU38486 alone, the levator ani underwent significant (20%) hypertrophy. Administration of exogenous dexamethasone also caused pronounced atrophy of the levator ani muscle. This atrophy was prevented, to a significant degree, by simultaneous oral administration of RU38486. It is concluded that endogenous glucocorticoids, the actions of which are blocked by RU38486, may be involved in regulation of the mass of the levator ani muscle in intact rats. M.G.

N86-30344# Pacific Northwest Labs., Richland, Wash.
BIOLOGICAL STUDIES OF SWINE EXPOSED TO 60-HZ ELECTRIC FIELDS. VOLUME 5: HEMATOLOGY AND SERUM CHEMISTRY Final Report
Dec. 1985 127 p
(Contract DE-AC06-76RL-01830)
(DE86-005362; EPRI-EA-4318-VOL-5) Avail: NTIS HC A07/MF A01

The hematologic and serum chemistry responses in three generations of miniature swine chronically exposed to a 30-kV/m, 60-Hz electric field have been assessed in a series of screening experiments. Based on comprehensive analyses and sequential statistical evaluation of the data, there are no significant differences in any hematologic parameters in either the F sub 0 or F sub 1 generations when the exposed and sham exposed groups are compared. In F sub 2 swine, at 42 days of age reticulocyte values were significantly higher in both sexes exposed to the electric field than in the control group. In addition, the exposed males at 42 days had significantly lower values for erythrocytes, hemoglobin and volume of packed red cells than the control males. Other values were comparable between exposed and control groups. Serum chemistry evaluations between exposed and control groups also showed no consistent statistical differences. A few parameters did show occasional differences between groups in the F sub 1 and F sub 2 generations, including: higher levels of urea nitrogen, triglyceride and alkaline phosphatase in exposed F sub 1 piglets; significantly lower serum protein levels in exposed F sub 2 males; and fewer serum globulins in both sexes of the F sub 2 generation. In summary, when hematologic and serum chemistry parameters were compared in exposed and sham-exposed groups of swine, some sporadic effects were evident. These effects, however, failed to replicate consistently at subsequent sampling periods or across generations and were not present as statistical trends when appropriate multivariate analyses were performed. DOE

N86-30345# Pacific Northwest Labs., Richland, Wash.
BIOLOGICAL STUDIES OF SWINE EXPOSED TO 60-HZ ELECTRIC FIELDS. VOLUME 6: IMMUNOLOGY Final Report
Dec. 1985 61 p
(Contract DE-AC06-76RL-01830)
(DE86-005363; EPRI-EA-4318-VOL-6) Avail: NTIS HC A04/MF A01

Immunological response in three generations of miniature swine chronically exposed to a 30-kV/m, 60-Hz electric field have been assessed in a series of screening experiments. The study was designed to investigate functional aspects of the humoral and cellular components of the mammalian immune system. Circulating levels of immunoglobulins were measured in parental-generation (F sub 0) sows (0 to 22 months of exposure), first-generation fetuses (F sub 1) at 100 days of gestation, F sub 1 females (0 to 32 months of exposure) and second-generation (F sub 2) weanlings at 1.5 and 6 months of age. No consistent, statistically significant changes in the levels of serum immunoglobins were observed when exposed groups were compared with sham-exposed controls, either within or across generations. An examination of cellular immunity included measurements of the mitogen response of peripheral-blood lymphocytes (PBL), spleen cells and lymph-node cells of F sub 0 sows sacrificed after 100 days of pregnancy, and PBL, spleen cells and thymocytes of F sub 1 fetuses at 100 days of gestation. Mitogen response studies of PBL, spleen cells, thymocytes and lymph-node cells of 42-day-old F sub 1 male weanlings and F sub 2 male and female swine were also conducted. In the statistical comparisons of mitogen-response data obtained for F sub 0 , F sub 1 , and F sub 2 swine, no consistent differences were observed between exposed and matched sham-exposed control groups. These observations indicate that the distribution of cells in the various tissues studied and the responses observed were not altered as a result of exposure to the fields. DOE

N86-30346# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELD ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES Technical Status Report, Jun. 8 - 2 Aug. 1985
2 Aug. 1985 19 p
(Contract DE-AC02-80RA-50219)
(DE85-016121; DOE/RA-50219/T5) Avail: NTIS HC A02/MF A01

Progress made at calibrating the electric field distribution within and around cages used for behavorial testing of baboons is described. It is concluded that all of the parts of the system are rather constant in their readings. The only component which seems to show appreciable variability is the 4 cm probe. Although the optically coupled 4 cm spherical dipole probe usually performs well, it is becoming apparent that sometimes it can produce misleading results. Although we do not yet understand the situation completely, it appears as though there are at least two variables affecting the probe, battery voltage and humidity. DOE

N86-30347# Southwest Research Inst., San Antonio, Tex.
EFFECTS OF 60 HZ ELECTRIC FIELDS ON OPERANT AND SOCIAL STRESS BEHAVIORS OF NONHUMAN PRIMATES Project Technical Status Report, 23 Nov. 1985 - 17 Jan. 1986
24 Jan. 1986 13 p
(Contract DE-AC02-80RA-50219)
(DE86-005807; DOE/RA-50219/T8) Avail: NTIS HC A02/MF A01

The objective was to investigate, using baboons (superspecies Papio cynocephalus) as surrogates, possible behavioral effects associated with exposure to high intensity 60 Hz electric fields. This program consists of four major projects. The first will evaluate the potential aversive character of exposure to 60 Hz electric fields by determining the threshold intensity which produces avoidance or escape responses. The second project will estimate the threshold intensity for detection of 60 Hz electric fields. The third will assess effects of chronic exposure to 60 Hz electric fields on the performance of two operant conditioning tasks, fixed ratio (FR) and differential reinforcement of low rate responding (DRL). The fourth will investigate the possible stress-inducing effects of chronic exposure to 60 Hz electric fields on the behavior of baboons living in small social groups. DOE

N86-30348# Institute of Nuclear Energy Research, Lung-Tan (Taiwan).
BACTERIAL INACTIVATION BY MEANS OF IONIZING RADIATION
M. S. CHANG, L. H. CHEN, and Y. K. FU Nov. 1984 19 p In CHINESE and ENGLISH
(DE86-901038; INER-0575) Avail: NTIS (US Sales Only) HC A02/MF A01

Spores of Bacillus subtillis and Escherichia coli are the most common air-borne bacteria. B. subtilis is radiation resistant and is commonly used as the test strain for routine control of heat sterilization. A study of surviving fractions of spores of B. subtilis, E. coli, and Streptococcus faecium A21 irradiated by (60)Co gamma-rays was carried out to determine the suitable dose for medical sterilization by irradiation. DOE

N86-31421*# East Carolina Univ., Greenville, N.C. Dept. of Biology.
EFFECTS OF LUNAR SOIL, ZAGAMI METEORITE, AND OCEAN RIDGE BASALT ON THE EXCRETION OF ITOIC ACID, A SIDEROPHORE, AND COPROPORPHYRIN BY BACILLUS SUBTILIS
T. ITO *In* NASA. Johnson Space Center NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 12 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 06C

Samples of lunar soil (10084,151), Zagami meteorite, postulated to be ejected from Mars, and ocean ridge basalt, the most abundant volcanic rock on earth, all completely inhibited the excretion of itoic acid and of coproporphyrin by Bacillus subtilis, a common airborne bacterium. Since such inhibition has been known to occur only under iron rich growth conditions(the excretion of these compounds occurs under iron deficient growth conditions), the result indicated that the organism was capable of extracting iron quite readily from these materials. A sample of synthetic ilmenite completely failed to inhibit the excretion of coproporphyrin, and inhibited the excretion of itoic acid only slightly. The result suggested that much of the iron extracted by the organism must have come from iron sources other than ilmenite,such as pyroxenes and olivines,in these natural materials tested. Author

N86-31431*# Texas Univ., Houston. Dept. of Environmental Sciences.
CYTOGENETIC ANALYSES OF PERIPHERAL LYMPHOCYTES SUBJECTED TO SIMULATED SOLAR FLARE RADIATION
H. M. PRICHARD *In* NASA. Johnson Space Center NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 9 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 06R

Solar flare protons share many radiological health characteristics of the inner Van Allen Belt protons, and both types of radiation pose serious dangers to a number of missions planned. It is appropriate to evaluate crew dose determination procedures in terms of the type of radiation responsible for the major part of the projected exposure, i.e., protons in the neighborhood of 100 MeV. Monitoring chromosome abnormalities in peripheral lymphocytes is one method to determine an individual's accumulated radiation dosage. Cell culture and harvest is a relatively simple procedure and is well within the capabilities of a station health facility, but the evaluation of prepared microscopic slides is a time consuming and subjective procedure. This project is part of an effort to demonstrate the utility of automated image processing and evaluation procedures in expediting dose evaluation. The initial goal of this project is to produce a set of reference chromosome spreads produced from control lymphocytes and from lymphocytes exposed in whole blood to protons or gamma rays. The results of manual and automated aberration scoring will ultimately be compared to test for systematic differences between the two evaluation procedures and between the two radiation qualities. Proton irradiations are performed at the University of Texas Health Science Center at Houston Cyclotron Facility. Proton dosimetry is supplemented by TLD packets from and by assay of short-lived proton activation products in the irradiation blood samples. Author

N86-31436*# Houston Univ., Tex. Dept. of Human Development.
SELECTION OF AN APPROPRIATE ANIMAL MODEL FOR STUDY OF BONE LOSS IN WEIGHTLESSNESS
I. WOLINSKY *In* NASA. Johnson Space Center NASA/American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program, 1985 7 p Jul. 1986
Avail: NTIS HC A99/MF E03 CSCL 06S

Prolonged weightlessness in space flight results in a slow progressive demineralization of bone accompanied by an increased calcium output in the urine resulting in negative calcium balances. This possibly irreversible bone loss may constitute a serious limiting factor to long duration manned space flight. A number of preventative measures have been suggested, i.e., exercise during flight, dietary calcium supplements, use of specific prophylactic drugs. In order to facilitate research in these areas it is necessary to develop appropriate ground-based animal models that simulate the human condition of osteoporsis. An appropriate animal model would permit bone density studies, calcium balance studies, biochemical analyses, ground-based simulation models of weightlessness (bed rest, restraint, immobilization) and the planning of inflight experiments. Several animal models have been proposed in the biomedical research literature, but have inherent deficiencies. The purpose of this project was to evaluate models in the literature and determine which of these most closely simulates the phenomenon of bone loss in humans with regard to growth, bone remodeling, structural, chemical and mineralization similarities to human. This was accomplished by a comprehensive computer assisted literature search and report. Three animal models were examined closely for their relative suitability: the albino rat, monkey, and Beagle. Author

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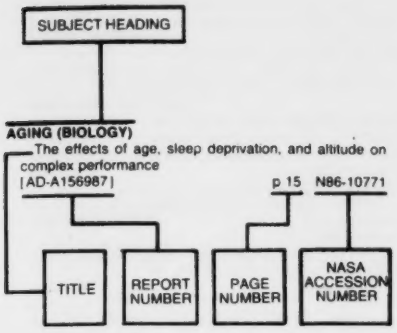

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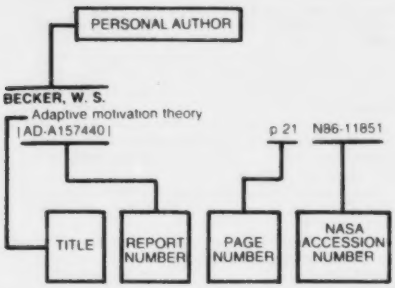

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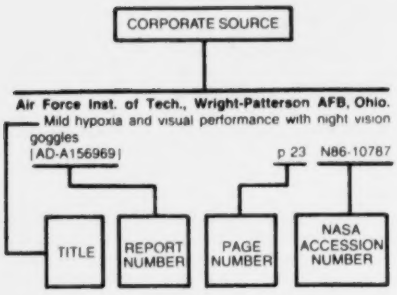

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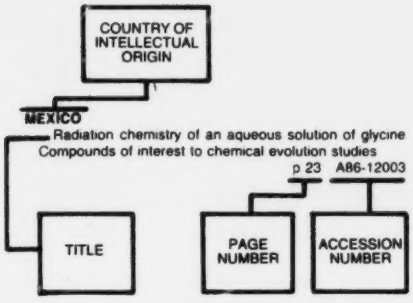

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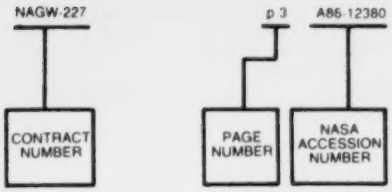

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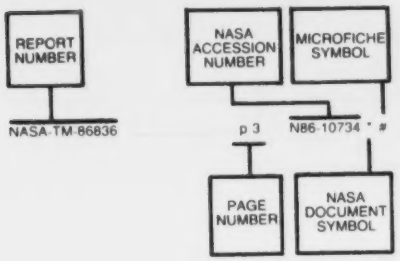

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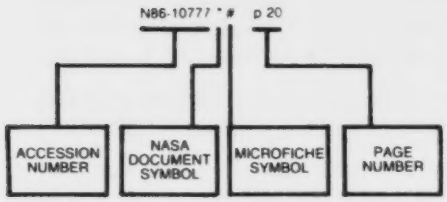

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